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ILLUSTRATED.

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VIEWS, NEWS AND INTERVIEWS.

Two young electrical engineers exist at the same boarding house. The other morning at breakfast one of them thoughtfully contemplated his cup of coffee and said: "Say, Bob, why is boarding house coffee like a poorly wired building?"

"Givitup," said Bob, as he reached for something to defend himself with.

"Because its full of grounds."

And the landlady murmured something about technical conversations being impolite and leading to no good end.

Wagg—We had a terrible thunderstorm as I came up in the train this afternoon.

Wooden—Weren't you afraid of the lightning?

Wagg—No; I got behind a brakeman.

Wooden—Behind a brakeman? What earthly good did that do?

Wagg—Why, he was not a conductor.—*Philadelphia Item.*

It is said that young Lord Russell, whose domestic difficulties are just now being aired in the English courts, wooed and won his wife in the guise of a mechanic while superintending some electrical work at her mother's house.

"Progress on the tunnel at Niagara Falls," said a recent visitor, "is being rapidly made. The work is about three-quarters finished and it is expected that Buffalo will be using electric power from the Falls by next Fourth of July."

Mr. Charles F. Brush, of Cleveland, stopped in New York a few days last week preparatory to sailing for Europe.

Prof. Alexander Graham Bell was a recent Boston visitor. It was reported that he went to confer with the American Bell Telephone Company in relation to the Berliner patent.

Mr. Geo. F. Porter has accepted the secretaryship of the National Electric Light Association. We do not think a more popular man in electric circles could have been secured. Mr. Porter has the experience, tact and energy that will make him a strong aid in continuing the success of this important Association.

Mr. Jarvis B. Edson delightfully entertained a number of his friends at the Montauk Club, Brooklyn, last week. Lieut. Knight, U. S. N., of the "Chicago," was the guest of honor. Among others present were Mr. Chas. A. Moore, president of the Club, Gen. H. C. King, Colonel Burleigh, Dr. Keep and Mr. Chas. Kirschoff.

When Cyrus W. Field was laying the Atlantic cable the following verse was published about him which has now been resurrected and given a new application:

Under mishap was Field both wild and rash,
Under success sagacious, bold and able;
The one was paying out and sinking cash,
The other paying out and sinking cable.

Every electrical man should plan to be present during the meeting of the National Electric Light Association, in Buffalo, February next. It promises to be a practical meeting of special importance, and every one who attends will be repaid many fold.

A gas man says that the electric light brings out creases and veins in a pretty woman's face which are not perceptible under gas light. Electric light men say that gas light makes complexions sallow. What is a pretty woman to use for lighting her dinner table?

LITERARY.

The Christmas number of *St. Nicholas* has before it every year the task of breaking the record. Not only must the current numbers be improved upon, but the past Christmas numbers must be cast, if ever so slightly, in the shade. Upon considering the difficulty of the task, the wonder cannot but grow each year, as it is successfully accomplished.

The Christmas *Century* is something more than the usual number of this magazine under a holiday name. It is pervaded with the spirit of Christmas, and both directly and indirectly touches upon the Christmas celebration. This characteristic is first evident in the cover, a new and special design, drawn by George Wharton Edwards, and printed in gold and brown on white.

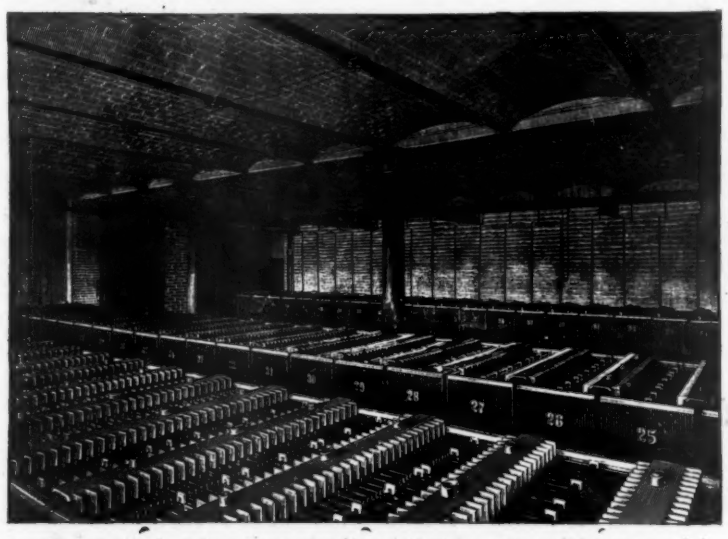

FIG. 1.—ACCUMULATOR ROOM IN SIEMENS & HALSKE ELECTRICAL PLANT AT CHARLOTTENBURG, GERMANY.

Brush is Ahead.

A perpetual injunction has been issued by the United States Circuit Court for the southern district of New York against the Electrical Accumulator Company, of Newark, N. J. The injunction restrains the Accumulator Company from making storage batteries in infringement of the patents of Charles F. Brush, now owned by the Consolidated Electric Storage Company. The effect of this injunction, it is thought, will be the closing of the factory of the Electrical Accumulator Company, and the acquiring by the Consolidated Electric Storage Company of a monopoly of the storage battery business of this country.

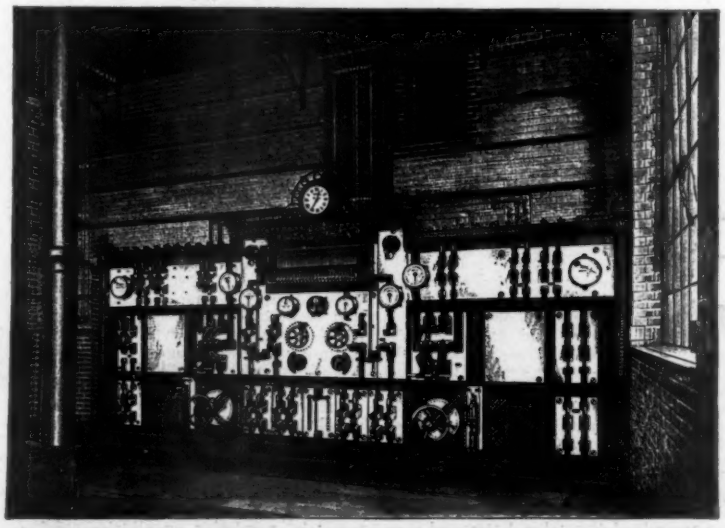

FIG. 2.—SWITCHBOARD IN SIEMENS & HALSKE ELECTRICAL PLANT AT CHARLOTTENBURG, GERMANY. (Described on page 225.)

We illustrate and describe at some length in this issue an electric lighting plant installed by the eminent German firm of Siemens & Halske, at their works at Charlottenburg. Our practical readers will peruse this article with interest.

SHALL THE GOVERNMENT CONTROL THE TELEGRAPH?

THE ELECTRIC CLUB DISCUSSES THIS QUESTION AT LENGTH AFTER LISTENING TO AN ADDRESS BY MR. E. ROSEWATER.

There was a large attendance of members and invited guests at the Electric Club meeting Thursday evening of last week. Mr. E. Rosewater, editor of the Omaha *Bee*, addressed the Club in favor of the government of the United States taking control of the telegraph systems of the country. An animated discussion followed, participated in by Mr. Erastus Wiman, Allen R. Foote, S. Insull, Samuel Bryan (of Washington), E. A. Leslie and others. Among the members present were: Gen. O. E. Madden, H. L. Shippey, C. O. Baker, Jr., John A. Seely, S. Insull, E. Wiman, J. D. Bishop, W. D. Sargent, Chas. W. Price, J. C. Reilly, Sam. Bryan (of Washington), T. C. Martin, J. C. Chamberlain, A. N. Bethel, Geo. W. Phelps, M. J. Sullivan, H. L. Storke, C. E. Stump, P. H. Alexander, R B. Corey, Nikola Tesla, Joseph Wetzler.

Among the invited guests present were the following, who apparently took a great interest in the address and discussion: E. L. Godkin, editor *Evening Post*, J. A. Sleicher, editor *Mail and Express*, A. B. Chandler, Geo. G. Ward, A. S. Brown and W. J. Dealy, well known telegraph men; John Chamberlain, of Washington; H. L. Cargill, of Boston.

President Insull called the meeting to order, and then invited Vice-President Erastus Wiman to preside. Mr. Wiman introduced Mr. Rosewater in a graceful little speech, and he addressed the Club as follows:

The founders of our republic conferred upon Congress the power to establish post offices and post roads. It is scarcely conceivable that it was their intention to limit the national legislature to the conveyance of the mails in post coaches running over wagon roads. The manifest scope of the constitution touching the exercise of the power to establish and maintain a postal system is to facilitate commercial and social intercourse between the people by the use of every device that will insure the speedy and economic transmission of intelligence. The century that has elapsed since Benjamin Franklin assumed charge of the first post office in the United States has witnessed the transition from the postal stage coach, the pony express and carrier pigeon, to the "fast mail" train drawn across the continent at the rate of a mile a minute; from the "60 days across the Atlantic" packet sail-boat to the "six days from New York to Southampton or Liverpool" twin screw steamer. But our postal system cannot attain its full measure of usefulness and efficiency until the electric telegraph and long distance telephone have been made an integral part of our postal facilities, with the pneumatic tube post as an auxiliary for conveying letters and messages in our great population centers.

Everybody familiar with the history of the telegraph knows that Professor Morse offered his invention to the government for the paltry sum of $100,000, and urged the postmaster-general to construct and operate telegraph lines as an adjunct of the mail service. It is also historic that the monumental mossback who occupied the position peremptorily declined the offer of Professor Morse, on the ground that in his judgment such a thing as transmitting messages from one point to another over a wire was preposterous and impossible. In

due time, Professor Morse prevailed upon Congress to appropriate $30,000 for the construction of an experimental line of telegraph, and with this money the first wire built and operated in America was erected between Baltimore and Washington. So the telegraph at its very inception owed its successful introduction in America to the munificence of the government, and by rights it should have been operated as a part of our postal system from the outset.

In 1862 Congress was again invoked to aid in the extension of our telegraph facilities. At that time the most rapid communication between the people east of the Mississippi and those on the Pacific coast was by the overland stage and pony express. A bonus of $400,000, payable in 10 annual instalments, was voted to the company organized to build the Pacific telegraph line. This extension of the telegraph across the continent, from the Missouri river to Sacramento, involved the construction of about 1,700 miles of pole line. The bonus of $235 per mile not only paid for the whole line but left a very considerable margin. The promoters of the enterprise, within five year's, realized three dollars for every 15 cents they had actually invested. I have recalled these historic facts merely to disabuse the minds of many who labor under the delusion that our telegraph system, unlike that of other countries, has been built up entirely by private capital and individual enterprise. It is not my purpose at this time, to indulge in an exhaustive history of our complex system of telegraphs under corporate ownership. Suffice it to say, it is the natural outgrowth of promiscuous construction, wasteful competition, and reckless absorption. A bird's-eye view of our telegraphs would present a dense jungle of poles planted and transplanted, and a bewildering network of wires strung and restrung by a succession of stock jobbing speculators. As an inevitable consequence, the Western Union Company, which has swallowed more than 60 big and small competitors, is periodically overstocked with needless wires between great commercial centers which usually offer the most tempting field for enterprising men who build lines to sell out, while there always has been a lamentable lack of telegraph facilities at small cities and towns that are made dependent entirely upon the congested railroad wires. Our telegraph companies never maintain an office where the receipts do not offset the expenses. Such a policy is not pursued in countries that possess postal telegraph facilities, because the government is at no additional expense for rent, and postmasters in small towns and cities are required to perform the duties of telegraph operators.

Nothing has impressed upon me more forcibly the dangerous tendencies of telegraph inflation and over-capitalization than the comparative exhibit of the world's telegraph system submitted to Congress last Winter by the president of the Western Union Telegraph Company. According to Dr. Norvin Green, this country has 185,000 miles of telegraph pole line, as against 375,000 miles possessed by all other countries of the world. There are 673,000 miles of wire in the United States, as against 1,111,968 in all other countries, and there are in America 18,000 telegraph stations, against 53,000 in all other countries. Mr. Green computes the aggregate number of telegrams handled in this country at a fraction over 60,000,000, while he credits the rest of the world with handling 173,000,000 telegrams. As a matter of fact, the aggregate number of telegrams handled in European countries alone, computed officially for the year 1889, is 204,935,055. What do these figures show? With one-half of the world's telegraph line mileage, American telegraph companies should have handled one half of the business. Instead of handling 102,000,000 telegrams, they only handled 60,000,000. With one-half of the world's telegraph lines in a country that boasts two thirds of the railway mileage of the world, America should have her full quota of the world's telegraph stations; but out of 53,000 we only have 18,000, including railroad offices, which comprise nearly three-fourths of our telegraph stations. On the other hand, Great Britain, with less than one-third of the wire mileage of the United States, handled 63,403,399 telegrams in 1889. Do not these figures demonstrate that the periodic acquisition of lines built for speculation prevents the economic working of our system by clogging it with useless wires, and will always operate as a barrier to a material reduction of our telegraph tolls, because our telegraph companies adjust these tolls on the basis of a capitalization which at this time already includes from $40,000,000 to $50,000,000 of stocks and bonds issued for speculation plants?

Let us take a cursory survey of the government telegraphs abroad. I trust that I violate no confidence in stating that before embarking for Europe last Summer, I procured letters of introduction from Postmaster-General Wanamaker to the postmasters of England, France, Germany and Austria, coupled with a request that their respective departments extend to me the facilities for making an inquiry into the practical operation of their systems of telegraph. This investigation was a self-imposed task. I have for more than a quarter of a century been an outspoken advocate of the postal telegraph, and desired to see for myself how it worked in foreign countries. Upon presentation of my credentials, I was everywhere accorded the most courteous reception. The chiefs of the telegraph bureaus, telegraph engineers and superintendents, took pains to exhibit the operating rooms, instruments, batteries and appliances to me, explained to me the methods pursued in handling dispatches and freely answered all inquiries concerning construction of lines, subways, office regulations, number and qualification of employés, working hours and wages. They also furnished me sample telegram blanks and official documents relating to the management, extent of plant and business done. The Hon. J. Cameron Lamb, general manager of postal telegraphs for Great Britain, favored me with an official letter to the postmasters of Manchester, Birmingham and Swansea, which enabled me to inspect the telegraph operating rooms and investigate the operation of postal telegraphs in those so-called provincial cities.

I will read you Mr. Lamb's letter which I was permitted to retain as a souvenir of British official courtesy:

To R. M. Johnson, Esq., Postmaster and Surveyor, Manchester; J. F. Wight, Esq., Postmaster and Surveyor, Birmingham; E. H. Oakden, Postmaster, Swansea.

DEAR SIRS—The bearer of this note is Mr. Edward Rosewater, Omaha, United States. The postmaster-general desires that he may have full information regarding the telegraph work in your offices, and I am to ask that you will be good enough to allow him to see the operations actually performed and to afford him all necessary facilities. I am, dear sirs, yours very truly, J. C. LAMB.

Similar courtesies were extended to me by the director-general of the German postal telegraphs, Dr. Haake, and Dr. Newbauer, director-general of the postal telegraphs of Austria.

The first step toward merging the telegraph system of Great Britain with the postal service was taken in 1868, when Parliament passed an act authorizing the purchase or leasing of all lines operated by private companies.

The proposition to establish a postal telegraph had been vigorously opposed by the telegraph companies at every step and when the transfer was finally made, the government came into possession of a conglomerate system of lines which had been allowed to run down by the companies from the time Parliament had voted to take them out of their hands. The act of 1868 fixed the uniform rate of one shilling (25 cents) for a message of 20 words, exclusive of address and signature, and three pence (6 cents) for each additional five words, to all parts of the United Kingdom. This was a material decrease from then existing rates and, as a natural consequence, the postal telegraph lines, in their wretched condition, were for a time inadequate to handle the increased business. This defect was, however, remedied as soon as the tumble down lines had been reconstructed and the old plant had been thoroughly overhauled.

In 1870–71 the number of messages handled by the British postal telegraph was 9,850,177. In 1874–75 the number had increased to 19,253,120. In other words, the number of telegrams handled had doubled within five years In 1880–81 the number of telegrams handled was 29,411,982, another increase of 55 per cent. in five years, and in 1885 the number of messages handled had reached 39,146,283. By the Act of October, 1885, the rate on telegrams to all parts of Great Britain was reduced to six pence (12½ cents) for a message of 12 words, including address and signature, and one half penny (one cent) for each additional word. This reduction was followed by an enormous increase of business. In the year 1886–87 the number of telegrams handled was 50,243,639, and in the year 1890–91, 62,403,399.

This vast volume of telegrams is handled by the British postal telegraph with promptness and marvelous accuracy, so far as I was able to observe. In London, the city messages are transmitted exclusively by postal pneumatic tube. The pneumatic tube department in the great central telegraph station handles the bulk of the letters, despatches and cards that are delivered within the city of London. Outside of the London Exchange, which is supplied with an independent system of direct commercial wires, all communications within the city of London proper are dispatched by pneumatic tube.

Thousands of dispatches, letters and postal cards are literally shot by air pressure every hour of the day from the 20 postal tube stations, located at the points most accessible, into the central telegraph station, and there they are redistributed and fired back to other stations, delivered by carriers or forwarded by telegraph or telephone to points outside of London. The longest of those tubes is that from the Westminster Parliament building, through which the proceedings of Parliament are shot to the central telegraph office and thence transmitted by wire to provincial cities or delivered to such London papers as may order duplicates.

The tubes have not only enabled the postal authorities to transmit the dispatches and city letters in London more rapidly than they could be forwarded by wire, but they have done away with the costly and inefficient local wire service and, in a measure, the pole and wire nuisance. But to the public the greatest benefit of the tube system is its cheapness. In New York or Chicago a city message of 10 words or less costs you 20 cents. In London you can send as many words as you can write on the blank or card, which varies from 100 to 1,000 words, for sixpence (12½ cents), and, what is also important, your message will have been delivered almost before the girl that usually acts as operator in the hotels of local offices in our cities has had time to copy it. By the tube system no copying is done—the original message is delivered to the party to whom it is directed, unless it is to go by telegraph or telephone to points beyond London.

While London was the first city to utilize pneumatic tubes for the rapid transmission of mail matter and telegrams, the cities of Paris, Vienna and Berlin have for years been served by pneumatic tube post. During the year 1889 the pneumatic tube post of Vienna handled 2,692,752 letters, telegrams and postal cards. Of this number, 1,541,647 were telegrams. But the city of Berlin can truthfully boast the most perfect and best served system of postal pneumatic tubes in the world. While London has only 20 pneumatic tube stations, Berlin now has 51 distributed not merely over the entire area of the German capital, but reaching out into the suburbs. You may deposit your message in one of the pneumatic tube stations, and it will reach any point within the radius of 10 miles within six minutes, including a re-transfer at the central tube station. For six cents and a half your message or letter, inclosed in one of the red Rohr post envelopes, will be fired through the tubes from Berlin to Charlottenberg, and delivered by postal carrier.

Berlin has about the same population as New York, but New York does four or five times as much business by mail or telegraph. But it takes from one hour to half a day to transmit and deliver a message by mail or wire from the City Hall to Harlem.

The postmaster-general of Great Britain was empowered by the Act of 1868, which authorized the acquisition of the telegraph lines, to facilitate the collection and transmission of dispatches by designating places for depositing telegrams in letter-boxes and other depositories, and telegrams deposited therein are, if written on stamped paper of proper value, conveyed by letter carriers to offices of transmission, by wire or to the tube stations, free of charge. This is a convenience that we cannot secure so long as our telegraph lines remain under corporate ownership. But the postal telegraph facilities in London, even without this special convenience, could scarcely be improved on. At the present time there are 538 stations in London from which telegrams may be forwarded. Of this number, 451 are branch post offices and 87 are railway station offices. Inasmuch as the telegraph tolls are uniform throughout Great Britain, parties simply purchase stamps covering the cost of any message and the stamped blank is rushed through the tube to the central station, and thence transmitted by wire to its destination. A telegram with the proper stamp attached, dropped into a post office box in any city in Great Britain, will be wired from the nearest telegraph station just the same as if the sender had gone through the tedious formality of handing it directly to the receiving clerk at the telegraph office. For the accommodation of business men and other patrons who use the telegraph frequently, stamped telegraph blanks are supplied at a trifling extra charge for paper. Similar conveniences are enjoyed by the people of France, Germany, Austria and other countries of Europe.

It would be impossible within the scope of this lecture to describe in detail the great operating rooms of the capitals of Europe.

The largest telegraph office in the world is in the British metropolis, employing an aggregate of over 33 operators and clerks in one building. Of this number two-thirds are men. The female operators occupy a large and well-lighted hall in which the Morse instruments, with registers and paper reels, are used exclusively. Nobody is permitted to receive by sound; and this is also the strict regulation on all telegraph lines where Morse instruments are used in France, Austria and Germany. The main operating room in London is like a great machine shop, although not half as noisy as the main office of the Western Union in this city. All the most improved telegraph appliances are utilized. The English Wheatstone with modern improvements appears to have the preference. The Hughes printing instruments, perfected in England, are receiving greater appreciation in Europe than they do in America.

In Berlin the Hughes printing instrument has the preference and 100 of these are used in the central telegraph station. Delany's sextuplex, an American invention, has been in active use in London for several years and the inventor and patentee received £20,000 and $10,000 royalty per year from the British government. This fact affords sufficient proof that the government telegraphs in Europe utilize all the inventions as rapidly as do the American private companies. The operating room of the Central Paris telegraph office is a rectangular hall with Gothic arch ceiling. The operating tables are placed to insure convenience for retransmissions. The Morse instruments are in use on short circuits, and the Hughes printing machine operates on several lines, but the favorite instrument on the French telegraph is the Baudet. This is a printing telegraph operated by synchronic movement. The only skill required is in transmitting. The receiving is automatic, by paper roll three-fourths of an inch wide on which a message is printed. These printed slips are pasted on telegraph blanks and delivered as they are received. The Baudet instrument has been perfected so as to operate duplex and quadruplex—this is sending and receiving two or four dispatches simultaneously over one wire. The operating force in the main office at Paris consists of 550 men and 450 women. The day operators work seven hours and the night men 10 hours. The night men receive larger pay, and extraordinary pay after midnight. In France, as in England, the postal telegraph employés are allowed two weeks' vacation each year with full pay. At the central telegraph station in Vienna about 500 instruments are in use, largely composed of Morse registers and Hughes printing machines. The Hughes instrument has been perfected by an ingenious Austrian electrician and is now operated on several long wires as a quadruplex. The American plug switches supplied with wires separated into divisions, most in use in Vienna, are exceptional features. At London, Paris and Berlin, the switches are altogether on a different model. At the Berlin central telegraph station no duplex or quadruplex instruments are in use, the government having supplied an abundance of wires for the volume of business done.

One of the novelties introduced at Berlin is the use of an accumulator battery. This battery consists of 120 cells divided into three sections of 40 each; only two of these sections are in use at any one time they operate. A steady current and no variation has been noted during the 10 months that they have been in use. The German governments pay the Berlin Electric Lighting Company 16 marks, or less than $4 per month, for maintaining this battery, from which 300 wires are steadily supplied with electric current. The managers of the Berlin office pride themselves upon the fact that they have worked direct with Teheran, the Persian capital, a distance of 3,500 miles. A through line from Berlin to Rome over bronze wire works admirably and is now in constant use. The most commodious and magnificent telegraph office in all Europe at the present time may be found at Birmingham. The operating room in Birmingham is a new building recently completed by the government. The room is a quadrangle, 206 feet by 42, lighted from all sides and equipped with the most modern appliances and the finest test-board switches in all England.

This rambling survey of the great telegraph stations of the European capitals may be somewhat disappointing, but it is impossible, within the limit of time at my command, to enter into greater details.

The impression has prevailed in this country that the postal telegraph service of Europe does not afford as good facilities and cheap rates to the press as do the telegraph lines of America. This I have found to be erroneous. While the British postal telegraph does not permit preference in the transmission of dispatches to any patron, the press dispatches are transmitted over special wires. The efficiency of handling press dispatches in London surpasses anything I have ever seen. Reporters and correspondents file their dispatches, enclosed in special envelopes, directed to the Intelligence Bureau; they are immediately shot into the central postal telegraph building and transferred through a pneumatic tube into the Intelligence Bureau; there the envelope is opened, the dispatch checked, and at once transmitted by special wire, or by telephone, as the sender may direct. Press dispatches may be duplicated to any number of papers, and parliamentary proceedings and other general news is often wired simultaneously from 200 to 300 papers. The Intelligence Bureau supplies leased wire service to leading dailies, and one may lease a wire for all night, or for short periods, at very reasonable rates. The London *Times*, Manchester *Guardian*, Liverpool *Courier*, and dailies in Edinburgh, Glasgow and Dublin, receive the bulk of their

(*Continued on page 226.*)

Electric Launches.

FIRST ON THE PACIFIC COAST TO BE PUT ON LAKE WASHINGTON, AT SEATTLE.

Next spring the first electric launches ever seen on the Pacific Coast will be put on Lake Washington, a sheet of water 27 miles long, lying directly back of Seattle. Two cable lines are built to the lake, and at their termini are boat houses, bathing pavilions and pleasure grounds. The Union Trunk Line, of Seattle, has just completed an electric road to the lake, and it will also lay out a small park. The electric launches have been ordered by the company from Leo Daft, of this city, and they will be ready for use in May.

There will be two boats 35 feet long with six horse-power motors and two 28 feet long with four horse-power motors. The former will seat about 35 and the latter from 15 to 18 persons. The motors will be operated by electrical energy from storage batteries placed on board the boats and charged from the trolley wires of the electric railway. The batteries will be charged for an eight hours' run, and the process of charging is expected to occupy about four hours. The space in the bilge or under the seats will be utilized for the batteries and motors, so that they will take up no room available for passengers.

The boats will be constructed after the Herreschoff models, which are the fastest in the world for small craft. The larger launches will attain a speed of eight or ten miles an hour, and the smaller ones six to eight and a half miles, so that the larger ones will be able to run to either end of the lake without recharging, if run at a moderate speed. If driven to their utmost speed they could not go so far, as the increased consumption of energy would be so much more in proportion than the increased speed.

Mr. Daft, in speaking of his work, said to the correspondent of the ELECTRICAL REVIEW: "Electric launches are in pretty general use on the river Thames in England by private parties and the British government. Storage stations have been established at intervals along the river, as far up as Oxford, to charge the batteries. The boats have an ordinary capacity of eight hours' run, and their usual speed is eight miles an hour. The battery must be recharged within the eight hours, as it is not advisable to exhaust the energy. Between London and Oxford there are two stations, so that launches can recharge and return up or down the river. The process is like taking along an impalpable energy without increasing the weight of the cargo. Each launch has a flexible cable containing two thoroughly insulated conductors, and these terminate in binding posts. When the boat comes to a charging station she makes fast to the wharf and throws the cable ashore. The cable is hooked to two of several terminals connected with a charging dynamo, the current is passed through an ammeter and the quantity of electricity in watts—one watt being the seven hundred and forty-sixth part of one horse-power—is read off and charged for. You can put on just as many watts as you require, for, at the station, there is an automatic cut-off, which snaps as soon as the required charge has been given and cuts off the connection, so that there is no danger of overcharging. It would be possible to have spare batteries, so that an exhausted one could be exchanged for a fully charged one, but they are very heavy and there is an objection to disturbing the internal arrangements. They also have to be so placed as to trim the boat." H. L.

Seattle, Wash.

Tried by Fire.

The recent burning of the car barns of the Second Avenue Passenger Railway Company, which resulted in the total destruction of 26 cars, demonstrated an interesting fact in connection with the electrical apparatus. In making an investigation of the wreck, in order to discover whether there might be anything left to be again used, the railway company found that of the various electrical equipments which were operated on the cars of its line, the motors of the Westinghouse Electric and Manufacturing Company were the only ones that could be utilized again, they being in a condition somewhat similar to that of a good safe which has passed through a fire; while the motors of the other makes were only valuable to be thrown into the scrap heap.

This is a significant fact on the side of the claim of the Westinghouse Company that their motors are made of better material and that their construction is more substantial, and that they are, therefore, better adapted to the severe service to which they are subjected in street railway practice than is any other make of motor. This care to provide for the extraordinary strains to which street railway apparatus is subjected will, no doubt, be looked upon by the street railway companies as a proof of the superior excellence of the Westinghouse manufacture.

It would appear that the Second Avenue Company has accepted this fact fully, inasmuch as they have already purchased from the Westinghouse Company complete equipments to replace all of those that were destroyed by the fire.—*Pittsburgh Post.*

Portable Electric Light Installation.

The accompanying engravings illustrate a portable electric light installation at the Frankfort Exposition, according to our British contemporary, *Electricity*.

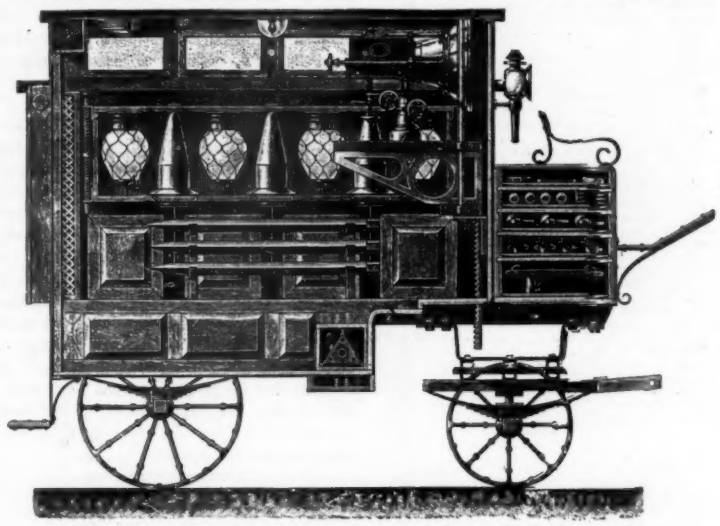

FIG. 2.—VIEW OF INTERIOR OF PORTABLE ELECTRIC LIGHT PLANT.

It can serve either for operating a single large reflector lamp or several arc lamps of smaller candle-power, and consists mainly of two carriages, one of which, the machine carriage, carries the boiler, with water reservoir and coal box, the steam engine and the dynamo; while the second carriage contains the measuring and regulating apparatus, the arc lamps, conducting wires, tools, etc. The installation illustrated in our figures is intended for feeding six arc lamps of 600 candles each, or a single light of 35 amperes, as well as a number of glow lamps for lighting up the two cars.

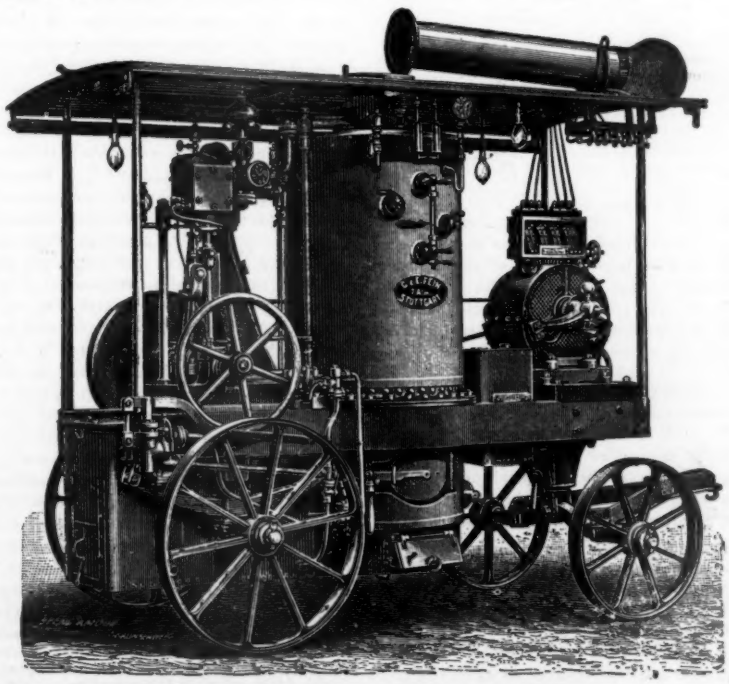

FIG. 1.—PORTABLE ELECTRIC LIGHT INSTALLATION.

Fig. 1 shows the machinery car; the boiler occupies the center of the car; the coal box and the water reservoir are placed in the bottom part. The armature of the dynamo is provided with two windings, by means of which, at the same speed, either a current of 65 volts for operation of the large reflector, or a current of 120 volts for feeding the six arc lamps, can be obtained. The latter are arranged in three series of two lamps each. The two armature windings can be arranged in series or in parallel with the electro-magnet windings by means of a switch placed on top of the dynamo casing.

The supplementary car, shown in Fig. 2, is of very light construction, so that it can easily be drawn by two horses. The light masts and poles for suspension of the wires are arranged on either side of the car; on the right and left of the driver's box are lanterns for night service, and there is room on the box for two men besides the driver. Underneath the seat is a box closed by iron doors containing tools, glow lamps and arc carbons, and behind it is a small platform on which stands the man attending to the reflector. This latter can be hoisted to the roof of the car by a proper contrivance; the six arc lamps are suspended inside the car. There are four wooden boxes on either side of the car, closed by doors which can be opened from the outside, and containing the cables wound on drums for making connection.

Within 10 or 15 minutes after the arrival of the cars the steam engine and dynamo can be put in operation and the reflector connected up; and the arc lamps, if necessary, can be installed within a few hours.

It will be seen that all the details have been studied with the greatest care, and the installation could not easily be surpassed for compactness and reliability of working.

Electricity is soon to take the place of mule power on the street car line of Rome, Ga. Moneyed men of Washington and Boston have formed a company, with a capital of $100,000, purchased the old street railroad, and work on the construction of the new line will soon begin in earnest.

Bangor, Me.—The Electric Heat Alarm Company; capital, $25,000. President, E. M. Henry; treasurer and general manager, F. S. Palmer.

Omaha, Neb.—Metropolitan Street Lighting Company, of Omaha, Neb.; capital, $25,000. Promoters, Geo. J. Sternsdorff, Geo. E. Specht, of Omaha, Neb.

Malvern, Ia.—Malvern Light and Power Company; capital, $10,000. Promoters, J. D. Paddock, L. W. Boehmer. Incorporation papers sent to L. W. Boehmer, Malvern, Ia.

Litchfield, Ill.—Litchfield Light, Heat and Power Company; capital stock, $50,000. Promoters, H. H. Brush, J. B. W. Amsden and Robt. M. Foster. Incorporation papers sent to J. B. W. Amsden, Litchfield, Ill.

Bowling Green, Ohio.—The Bowling Green Electric Light and Power Company; capital, $50,000. Promoters, Geo. S. Long, Joseph Schauer, E. H. McKnight, Jacob Henne and Sam. J. Miller. Incorporation papers sent to E. H. McKnight, Troy, Ohio.

Torrisdale Mills, Pa.—The Moulton Electric Light and Power Company; capital, $1,000. Promoters, Henry V. Massey, Edwin M. Thomas and Joel H. De Victor. Incorporation papers sent to Henry V. Massey, 505 Chestnut street, Philadelphia, Pa.

New Brighton, Pa.—The Home Electric Company; capital stock, $10,000. Promoters, L. Roggin Strobridge, Joseph E. Mitchell, N. N. Davidson. Incorporation papers sent to Stiffy & Calhoun, New Brighton, Pa.

San Francisco, Cal.—The International Electric Supply and Construction Company; capital, $5,000,000. Directors, Columbus Waterhouse, James Spiers, H. S. Crocker, C. O. Swanberg, C. S. Benedict, A. F. Johns, E. E. Parsons, C. Montgomery and Andrew Brown.

The Stockholders of the Manhattan Electric Light Company at War.

The directors of both the Manhattan Electric Light Company and the Harlem Electric Light Company have got themselves involved in rather an unpleasant legal muddle, and are now threatened with proceedings for contempt of court, through their efforts to consolidate, it is stated, chiefly for the benefit of the Manhattan, and at the expense of some of the minority stockholders of the Harlem Company.

The controlling interests of the two companies are practically identical, both plants occupying the same building, and the books of both companies being kept by the same bookkeeper. The Manhattan company, however, has a capital of $1,500,000 and a bonded debt of $900,000, while the Harlem company's capital is $250,000, with a bonded debt of $75,000. Last summer a circular was issued asking the stockholders in the Harlem company to change their holdings for stock in the Manhattan company, the scheme being to secure the income from the Harlem for the Manhattan. Some of the stockholders objected to this arrangement, and shortly after were informed that a judgment had been entered against the Harlem company in favor of the Manhattan for $145,000.

Measures were immediately taken to have the suit reopened and an order made that pending the reference nothing should be done toward collecting the judgment. It is alleged that, in violation of this order, the Harlem company voted to deposit $300,000 worth of bonds with the Manhattan company as security, and Judge Lawrence has declared that unless the resolution was rescinded he would hold the directors who voted for it in contempt.

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A most interesting paper could be read before the next meeting of the National Electric Light Association, on "Economy in the Boiler Room," by some practical central station man. Many a dividend has gone up the smokestack.

The recent storm in this city prostrated a number of heavy wire lines on the east side. To add to the annoyance to the electric light companies and their patrons, our authorities say the lines shall not be put up again. What a great, big, broad-gauged city government New York has!

It is said that you can recognize a Buffalo man anywhere on a windy day, by the sideways manner in which he comes around the corner in order to present as little of his body to the wind as possible. The wind always blows in Buffalo, so when you go to the electric light convention, in February, leave your high silk hat at home.

The question of the effect the electric current produces on young wines, will be submitted by the Russian Industrial Association to the convention of electricians to be held in St. Petersburgh early next year. It is claimed by several excellent authorities that fresh wine assumes all the qualities of the fermented and old article after being submitted to the electric treatment, and should this prove true it will be of inestimable advantage to wine growers. Can't the National Electric Light Association give this matter consideration at its next meeting?

Another murderer has been electrocuted at Sing Sing. The details are not obtainable as we go to press, but there is no reason to believe that this butchery has been any more successful or less painful than its predecessors.

Vigorous work is being done by the officials of the National Electric Light Association, and the meeting at Buffalo in February next promises to be the banner one. President Huntley is untiring in his efforts, has enlisted the interest of leading citizens of Buffalo, who will see that all visitors are hospitably treated, and is now formulating a programme that will be valuable from a practical and scientific standpoint.

When it became known in England that an American named Morse had applied for a patent for more rapid communication, and had been refused, one of the leading papers endorsed the refusal on the ground that Morse was behind the age. If he had come before railways had been established, it would have been different, but since such very rapid traveling over the United Kingdom had become possible, it was claimed to be rapid enough and entirely unnecessary to have something more rapid than that. It appears that the English people were so delighted with the rapid travel by railroad, compared with the old stage coaches, that they had lost their heads.

THE POSTMASTER-GENERAL'S POSTAL TELEGRAPH-TELEPHONE SCHEME.

The postmaster-general, in his annual report, recommends that the telephone as well as the telegraph be made part of the postal system. He remarks: "A year from next March the telephone patent expires, and unless Congress acts promptly to authorize its adoption for communication among the people, it requires no stretch of the imagination to believe that in the next two years one immense syndicate will unite and control all the hundreds of telephone plants of the country, as the telegraph is now controled." What sophistry! Mr. Wanamaker talks about "the telephone patent" as if the great art of telephony was supported by a single patent. If there is one thing that will prove difficult to accomplish without infringement of other patents after the expiration of the fundamental method patent in 1893, it is long distance transmission. If it is so easy a matter to form immense telephone syndicates, why has not the American Bell Telephone Company worked in this way instead of farming out its rights to thousands of licensees for local management? It would cost a pretty penny to purchase telephone rights, and Mr. Wanamaker will have no easy task to convince an economical Congress that such a step is necessary.

He declares that "the electric current belongs to the people by right and is bound to become their servant." According to the plan he has laid out "one cent letter postage, three cent telephone messages and ten cent telegraph messages, are all near possibilities." Among the economical methods by which he proposes to do a profitable business at these rates are the use of "pickel-in-the-slot" machines and the substitution of old soldiers for the present system of messenger boys "who rarely hurry, except in pictures." He apparently considers his last year's proposition to have his postmasters "learn the little tick" and operate the telegraph lines of the country as definitely settled, as the subject is not mentioned in this year's report.

The bold and foundationless assumption of the postmaster-general in this official report is that the only opposition to his electric undertaking comes from "the monopoly." Some of the assertions in it can easily be disproved. In one respect it is exceedingly weak. He charges, with an evident spite of temper, that the persons with whom he wishes the government to enter into important business relations will be actuated by dishonorable motives before they have been invited or had opportunity to express an opinion. Altogether the document, in dealing with this branch of the department's affairs, is not of the candid, dignified character which is becoming to the work of a member of the cabinet of the President of the United States.

A GOVERNMENT TELEGRAPH.

Mr. Rosewater's paper on the telegraph systems of European countries is interesting reading. While the facts he reports will not prove fresh news to many of our readers, they will be examined anew with keen interest, in view of the argument based upon them by the author for governmental absorption and control of the telegraph lines of this country. The paper evoked a lively discussion at the Electric Club, and Mr. Rosewater's deductions were spiritedly assailed by several able speakers. A fact ignored by Mr. Rosewater was noted by Mr. Erastus Wiman, that in England the telegraph has required a heavy deficiency appropriation ever since its purchase by the government. Mr. Foote, of the Census Department, showed that Mr. Rosewater's figures as to cheapness of foreign telegraphic service could not be relied upon when applied to this country, for the reason that the distance limit of transmission is so much greater here.

Much has been said on either side of this question. Whether the National government could redeem its bad record in other lines of work and give cheaper and better service than a private organization, can, at present, only be a matter of speculative inquiry; though by great odds the chances are that the service would cost more and be less efficient. Some one would have to pay the bills and the general public, which does not use the telegraph, would be forced to contribute to a luxury needed and enjoyed by the few. History has proven in every field of industry that business matters which can be conducted by the citizen are much more efficiently and economically handled than they could be by the general government; our own history shows the danger of increasing to the enormous extent which would be necessary, with this departure, the list of federal office holders. These considerations alone should be sufficient to put conservative minds on guard against governmental ownership of the telegraph. But there is another and deeper reason for caution. There is, unfortunately, a large class of people who regard the government as a paternal guardian, who should be intrusted with the management of the major part of our concerns, and that the panacea to cure every civil ill is the direct responsibility of Uncle Sam. This would make a *strong* government, undoubtedly, but would require a subversion of a fundamental principle of this republic, namely, to leave to the citizen the largest possible share of personal liberty and control him only when it becomes necessary for the common weal. Is there any stronger reason why the government should own the telegraph than that it should own the railroads or the canals? With the government there can be no competition to bring about a cheap and efficient service—there is no spur to excellence. One of Mr. Rosewater's arguments is that the moment opposition is offered in the telegraph business and begins to exert a wholesome influence, it is squelched by absorption in the "great anaconda." Is this any reason why the government should set up in a commercial business? If so, why not, as Mr. Wiman suggested, also buy out the Standard Oil Company or any other corporation of national proportions. There are many things besides telegraphic intelligence of interest to the general public; sugar and coal and oil and coffee, for instance, and if the government is to go into all these lines of business, it might as well go a little farther and plunge into nationalism, formerly yclept socialism. Would it not be much better and safer to make some attempt by restraining legislation to correct what weaknesses there may be in the present service? If a corporation attains such proportions that its system encompasses the whole country, it might be forced to discover to the public its true business condition, and wholesome competition would be surely invited if there were any glittering chances of financial success.

Electric power from Niagara Falls will probably be in use in Buffalo and Rochester within the next year.

CORRESPONDENCE.

OUR BOSTON LETTER.

The Providence Steam Engine Company, Providence, R. I., is enlarging its works; and by the first of the year the manufacturing facilities of the works will be largely increased.

The Aluminum Brass & Bronze Company, Bridgeport, Conn., has now ready for the electrical trade its No. 2 grade silicon bronze wire; and this new product possesses equal conductivity and other merits of No. 1 grade.

The Eastern Electric Light & Storage Battery Company, Lowell, Mass., has completed an installation of a storage battery plant in the Ames Building, this city. The batteries are located near the roof of the building, and will be used for night and Sunday use.

The Eastern Electric Cable Company, manufacturers of the celebrated "Clark" wire, this city, declared a semi-annual dividend of three per cent. on its preferred stock, payable December 21, to stockholders of record December 14. Books close December 14 and open December 22.

Messrs. Drake, Payson & Whittier, electrical engineers, Providence, R. I., are enjoying a very satisfactory business, having recently installed several isolated electric lighting and power plants. This enterprising young firm are Rhode Island agents for the Eddy Electrical Company and the Loomis system of electric lighting; and also keep in stock a complete line of electric light, power and electric railway supplies.

Superintendent E. L. Rohrer, of the Thomson-Houston works in this city, says that it is true the company is discussing the matter of removing all its power plant to less expensive land by the seashore. It will be enabled to secure its fuel much cheaper, as it would have a wharf of its own, where coal vessels could unload. The power from there would be transmitted to the factory through cables. The 26-inch search-lights will hereafter be made at the Middletown factory This portion of the electrical business has been very extensive for the past year, and nearly all the liners and coasters of any importance have been equipped with them.

Boston, Dec. 5. W. I. B.

OUR CHICAGO LETTER.

George Cutter has just filled an order for 250 of his street hoods, which brings the number in use up to 10,000. Such a tale in just two years shows that the article must have some special merit.

Personal.—D. B. Dean, with the Electric Merchandise Company, has returned from a trip East and reports a fine trade. Mr. Dean will go East again the latter part of this week to close a large contract for railway supplies.

The Orne Electric Construction Company have just completed the work of putting in the new *Herald* Building, on Washington street, a complete system of their galvanized iron speaking tubes with electric bell calls, which is giving great satisfaction.

The Central Electric Company reports a large increase in lamp business since it has taken the agency for the Swan lamp. This lamp, it is claimed, has an average life of from 600 to 1,000 hours and will not blacken even when nearly burned out. This company has taken the agency for the Washington carbons and is having a large call for them.

Monday Night's Fire in the building occupied by the Chicago Arc Light and Power Company, corner of Washington and Market streets, did considerable damage to their plant. Investigation of the buildings by officials showed that the engines and boilers were practically uninjured. The engines and boilers in service furnish 1,850 horse-power, and there is one 500 horse-power engine not yet in position. The 60 dynamos were damaged to the extent of $20,000, and the shafting in the building will have to be replaced entirely. Prof. Barrett, city electrician, with the sanction of Mayor Washburn, tendered the temporary use of the North side city station at Sedgwick and Superior streets for the accommodation of the company. M. J. B.

Chicago, Dec. 5, 1891.

Another Electrocution.

At Sing Sing prison, on Monday, December 7, at 12 01 P. M., Martin D. Loppy, of New York city, was electrocuted. Loppy stabbed his wife to death with a pair of shears, July 4, 1890. Warden Brown and about 20 witnesses were present at the electrocution.

Your Informant is Correct, Mr. Rankin.

Our business manager has received these lines:

ATHENS, GA., DEC. 3, 1891.

DEAR SIR: I wish to see a specimen copy of the ELECTRICAL REVIEW, as I am told it is the best source of information for electrical news issued.

Yours truly,
HENRY B. RANKIN.

Mr. Rankin has had a specimen mailed to him.

Is Actinism a Species of Electrolysis?

READ BEFORE THE ELECTRICAL SECTION OF THE FRANKLIN INSTITUTE, BY PROF. EDWIN J. HOUSTON.

In the present paper I have arranged and amplified the substance of the informal remarks made at the last meeting of the section concerning the possible identity of actinism in the growing leaf, when exposed to the sunlight, and electrolytic decomposition.

In the growing leaf, in sunshine, a series of complex decompositions occur, which result finally in the deposition of carbon and the evolution of free oxygen.

Assimilation in plants consists, with few exceptions, in a process of deoxidation. The food materials absorbed by plants are generally highly oxidized substances which are deoxidized during assimilation. This assimilation takes place mainly in cells containing chlorophyll, and this, almost without exception, occurs only in the presence of sunlight.

Sachs, in his *Text-Book of Botany*, says: "It is only the cells that contain chlorophyll, and these only under the influence of sunlight that have the power of decomposing the carbon dioxide taken up by them, and, at the same time, setting free an equal volume of oxygen in order to produce organic compounds out of the elements of carbon dioxide and water; or, in other words, to assimilate."

In nearly every species of plants the leaf is presented with one of its faces towards the sunlight, so that one face is illumined and the other non-illumined; or, at least, the illumination of one face exceeds the illumination of the opposite face. This latter is especially the case with leaves that are formed of comparatively transparent substances.

That differences of potential exist in the various parts of a growing plant is a fact that is now generally recognized. Too little, however, has been done in this direction to ascertain the exact character of these differences of potential.

Probably one reason so little is correctly known to-day concerning the differences of potential of growing plants, arises from the fact that such differences of potential can be brought about by so many different causes that probably the differences of potential arising from one cause or set of causes, mask or neutralize those produced by another cause or set of causes.

I desire in the present paper briefly to call attention to another probable source of difference of electric potential, that may still further mask or render difficult of detection the differences of potential existing naturally in growing plants.

Before doing this, however, I will briefly review some of the more important causes which produce differences of potential in growing plants. The principal of these are as follows, namely:

1. Various chemical processes that occur in the cell walls of the growing plant.

2. Molecular movements of liquids throughout the plant which result in the production of diaphragm currents. These molecular movements may either be those caused during the growth of the plant, or may be caused by the mere bending of the plant by the wind, or other cause external to the plant.

3. Differences of potential developed in plants which would result in currents of the general character of the demarcation currents observed in animals; that is, currents due to the chemical action of the various liquid materials exuded at the surfaces of injured or abnormal plant tissue.

4. Differences of potential due to the evaporation of moisture from the surfaces of the leaves, derived either from the rain or dew, or from the evaporation of liquid substances given off from the body of the plant.

5. Differences of potential arising from the electrolytic decomposition of carbonic acid, or the various forms which carbonic acid derivatives assume during assimilation.

The causes above enumerated refer to the differences of potential that have their seat in the structure of the plant itself. Another source of differences of potential is to be found in the differences of electric potential that generally exist between the atmosphere that surrounds the plant and the earth or soil in which it grows. These differences of potential being neutralized in the various parts of the plant itself, would, of course, result in the production of electrical currents.

I desire to call special attention to the fifth head, under which I have classed differences of electric potential in plants, viz., those arising from the electrolytic decomposition of the various oxygenated carbon compounds derived mainly, if not entirely, from the carbonic acid of the atmosphere.

That the action of sunlight on growing plants should partake of the nature of electrolytic decomposition is, perhaps, to be inferred from the general views now held in accordance with Hertz's theory as to the identity between sunlight and electro-magnetic radiations or waves.

These remarks should be regarded merely as suggestions made in the line of further investigations.

As far as our knowledge of growing plants extends, the oxygen which results during the general process of deoxidation, under the influence of sunlight appears to be evolved mainly from the non-illumined or darker face of the leaf, while the carbon, or the less highly oxidized carbon compounds, which are utilized by the plant for the production of its woody fibre and woody tissue, though afterwards deposited in all parts of the leaf, are probably mainly liberated at or near the illumined face.

If these facts be as above-mentioned, the decomposition in the leaf, under the action of sunlight, of the carbonic acid, or its derivative compounds, probably partakes of the nature of electrolytic decomposition.

In this direction I would suggest the following lines of investigation, namely:

1. To ascertain experimentally whether there exists on the opposite faces of a growing leaf, when exposed to the full action of sunshine, a difference of electric potential resulting from the polarization which always accompanies electrolytic decomposition; and if be so, what is the nature of such polarization.

If such differences of potential actually exist, it would, of course, follow, that the illumined face of such leaves, under polarization, would be mainly electro-negative, since it is at or near this face that the carbon and less highly oxidized carbon compounds appear, while the dark or less illumined face would be electro-positive, since it is here, for the greater part, that the oxygen is liberated.

2. Whether electrodes suitably connected to the opposite faces of a growing leaf in the presence of sunshine, will show the presence of an electric current arising from an equalization of the difference of electric potential.

The value of these differences of potential on the opposite faces of growing leaves, might, of course, be ascertained by the proper use of an electrometer.

3. Whether a suitable leaf battery could not be devised, by connecting, in alternate succession, the opposite faces of a series of leaves on a plant stalk.

That is to say, connect the illumined face of one leaf with the non-illumined face of another leaf, and so on in series until any feeble differences of electric potential that there might exist are sufficiently multiplied to sensibly affect the needle of a galvanometer.

4. A comparison of the effects of sunlight and artificial light, such as the electric light, on such electrolytic decompositions.

5. Whether any differences exist in the case of the light produced by an alternating current arc light and that produced by a constant current arc light.

6. Supposing the presence of the differences of electric potential due to the electrolytic decomposition to be established, and the direction of the electric currents so produced known, to ascertain whether an electric current led through the plant in the same direction as the current produced by actinism, would not tend to increase the assimilation and the subsequent growth of the plant; and, whether, on the contrary, an electric current sent in the opposite direction through the growing leaf would not tend to check such assimilation or growth.

According to some experiments recently made in France, it was shown that electric currents sent through plants under certain circumstances promoted growth. These currents were sent through the soil in which the plants were growing by electrodes placed in the soil. The nourishing substances in a quantity of manure, placed near one of the electrodes, were clearly carried in the line of the current, or between the electrodes.

7. To ascertain experimentally whether the converse of the proposition is true, namely, whether an electric current of approximately the same strength as that produced by actinism, when sent through the leaf in the opposite direction, would not result in the production of luminous phenomena in the leaf.

The following facts, well recognized in botany, would seem to show, to some extent, at least, the presence of a species of polarization in certain plants during active growth in sunshine.

In the case of those plants which bend or become concave on the side the most exposed to light, this curvature is due to the fact that a smaller growth occurs on the illumined than on the dark side. This is well recognized in botany, and such plants are called in general *heliotropic* plants. Since they are for the most part highly transparent, considerable light must therefore pass through their entire structure, and the difference in the illumination between the light and dark faces must be comparatively slight. This shows that such differences in growth may occur under comparatively small differences of illumination.

In the case of plants that turn toward the sun, it is a well-known fact that some plants turn towards the light. It is possible that this motion is in some manner the result of the polarization effected, during growth, by the sunlight.

AMONG THE PRESS WORKERS.

The New York Press Club installed its newly-elected officers Saturday of last week. The election had been a particularly heated one. The candidates on the regular ticket were elected by a majority of nearly two to one. They are:

President, John A. Cockerill.
Vice-presidents: Charles W. Price, J. I. C. Clarke, Frank A. Burrelle.
Treasurer, William Gibson, Jr.
Financial Secretary, Charles Henry George; Recording Secretary, D. G. Baillie; Corresponding Secretary, James C. Summers.
Librarian, J. Frank Clark.
Trustees: W. J. Arkell, Thomas H. Evans, Charles O'C. Hennessy, Oscar W. Riggs, H. D. Winton, J. I. Charlouis, James A. Gill, Charles Francis Hart, Edward Bunnell Phelps.

The selection of delegates to represent the New York Press Club at the next convention of the International League of Press Clubs, to be held at San Francisco, in January, was left to the president, who named the following delegates and alternates: Delegates—Charles W. Price, William Berri, W. J. Arkell, J. I. Charlouis, George F. Lyon, Thomas Evans, William R. Worrall, E. B. Phelps, Charles H. George, A. Frank Richardson and Marshall P. Wilder. Alternates—Thomas P. McElrath, S. C. Austin and Leon Salmon.

The Brooklyn *Standard-Union* published, on Saturday of last week, portraits of all the newly-elected officers of the New York Press Club, with interesting accounts of the newspaper career of each. This was newspaper enterprise in a new field, for, as a rule, the press says very little about the every day workers in the profession, and the *Standard-Union's* enterprise has been received with much favor.

Eugene Field, the delightful Chicago poet and critic, has been invited to address the next meeting of the International League of Press Clubs. If his health permits, Mr. Field will attend, but his arduous, ambitious literary work of the past years has almost broken down the physical man, although his mental powers are as brilliant and quaint as ever. It makes him "sick at heart," he writes a New York friend, to realize that he may not be able to meet with this interesting gathering of newspaper toilers to which he has been invited.

All of the Women's Press Clubs of this country will probably be represented at the next meeting of the League of Press Clubs. Delegates have been elected in many instances, and other clubs elect this month.

At a meeting of the governing board of the League of Press Clubs, in this city, it was decided to leave New York in a special train January 5, 1892, and go through to San Francisco by way of Chicago, Omaha, Denver, Salt Lake and Ogden. After the meeting the members of the board enjoyed the "Merry Monarch" at the Broadway theatre, and then discussed a particularly pleasant supper at Delmonico's, where they were the guests of Mr. M. H. DeYoung, of the San Francisco *Chronicle*, and his attractive wife.

Editor J. W. Scott, of Chicago, is very proud—and justly so—of his new *Herald* building, which was recently completed. This is one of the most complete newspaper establishments in the country, and electric lighting, signaling, etc., bear a more important part in its every-day work than in any other similar edifice.

Telephonic News

⁂ Middlesborough, Ky., now has a telephone exchange.

⁂ The telephone exchange at Tucson, Arizona, will be completed before the first of the year.

⁂ The Macon, Ga., telephone exchange has a new switchboard with a capacity for 1,500 subscribers.

⁂ The telephone service of Raleigh, N. C., has been greatly improved. Metallic ground wires have been put in.

⁂ The telephone company is raising the rates $1 per month for the use of instruments at Batavia, N. Y., beginning January 1.

⁂ New Berne, N. C., will soon have a telephone service. A franchise has been granted, and work will commence within 30 days.

⁂ The Winona, Minn., council has finally decided to give the Northwestern Telephone Company an ordinance allowing them to erect and maintain poles in the city for a period of 10 years. The company will entirely rebuild its plant in Winona in the Spring.

⁂ An indication of the importance of the position now held by the telephone service as compared with that of telegraphy has just been given in the result of a difference between the Western Union Telegraph Company and the New York Associated Press. It appears that the telegraph company issued a notice stating that the press corporation owed the company $10,000, which it was unable to collect, and that the telegraph connection of the agency would therefore be cut off. The Associated Press declared that if the telegraph company carried out its threat it would adopt the telephone system in defense.

⁂ General Manager A. B. Uline, Superintendent William H. Cull and Mayor Manning, of the Hudson River Telephone Company, have been in Philadelphia the greater part of the past week looking into the Law system of telephony, with a view of reporting their findings to the executive committee of the company in New York. The reason for this is that the Law system has been proposed for Albany. The system is looked upon with favor, and there is a probability that the executive committee will direct the general manager to alter the present system so as to conform with the principles of the Law system as now in use in other cities.

The Central Electric Company.

The Central Electric Company, Chicago, have again added to their quarters, being obliged to secure increased storage capacity for their stock. The large line this company handles, which includes appliances for all classes of electrical work, necessitates carrying a very large stock, and the business has increased during what has been accredited "dull times," very handsomely. This company, which is always in the front rank of progress, has recently put in a large stock of electric light carbons that will enable them to furnish carbons to consumers in Chicago at factory prices. The sales of Okonite wire have been larger than ever before, evidencing advancement in the use of high grade materials throughout the electrical fraternity. The Swan incandescent lamp, for which this company is general western agent, has obtained a popularity in the Central Company's hands that is also deserving of mention. The branch houses of this company, viz.: Southern Electrical Supply Company, of St. Louis; Gate City Electric Company, of Kansas City; Western Electrical Supply Company, of Omaha, and the Electric Power Transmission Company, of Denver, are doing a thriving business, and in this connection, the Central Electric Company can be said to be at the front of the procession in the West.

ELECTRICITY 150 YEARS AGO.

BY DR. P. H. VAN DER WEYDE.

IV.

We have the satisfaction to lay before our readers a correct portrait of the original frictional electric machine used by Benjamin Franklin, still the property of the Franklin Institute, Philadelphia, and which they had the kindness to loan to the New York Electrical Society in order to complete their historical electric exhibit at the American Institute Fair, five years ago. Most of the other historical objects at that exhibit were furnished by the writer, while a little later their history came to an untimely end, as reported in the ELECTRICAL REVIEW for

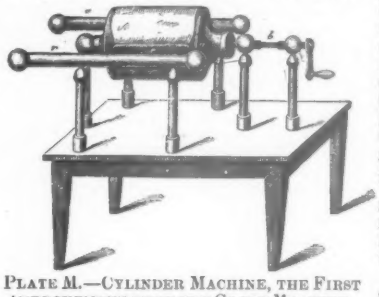


PLATE M.—CYLINDER MACHINE, THE FIRST IMPROVEMENT UPON THE GLOBE MACHINE.

September 27, 1890, page 61, by the destruction of the Brooklyn Institute by fire.

It will be noticed in this engraving that a provision is made for stretching the rope or belt which communicates the motion of the large wheel to the axis of the revolving glass globe. This is a very old and common device, and it is not to the credit of the examiners at the United States patent office that, a very few years ago, they granted a patent to an inhabitant of Elizabeth, N. J., for stretching the belt moving a dynamo in the self-same manner. In this way they made an ignorant would-be inventor pay to the United States treasury his $35 for a patent that, from its very nature, is worthless, and has been public property for more than a century.

The first improvement on the revolving glass globe like Franklin used and which is represented in Plate L was the cylindrical electric machine represented in Plate M, the form of which is especially adapted for practical young amateur electricians, as it enables them to make a serviceable machine at a very small expense. All that is required, in the absence of glass works, is a cylindrical half or quarter gallon bottle, such as is used for acids, ether, glycerine, etc. The only troublesome labor is to make a hole in the center of the bottom to pass the axis through. There are two ways to do this. First, to grind it through with a copper tube of the diameter of the hole intended and place this on the lathe, or to attach it to a proper swivel and revolve this by hand. If the copper tube is lubricated with oil and gritty emery added, it will grind through the glass, and this very easily and quickly, also, when the tube is placed on a lathe. The other way is to chip it through the glass with a sharp pointed steel punch, acted upon with a very light iron hammer. It is, in the latter case, necessary to fill the glass fully with sand so as to let the sand bear the blow, which might otherwise crack the glass by the vibration. When the hole is made a square axis is passed through. This axis must, of course, be turned off at two places, beyond which at one end the square shape is left for the attachment of the crank. Inside the rounded off parts there is, at one end, a shoulder and at the other end a thread and nut, placed at such a distance as is required to fix the bottle in place and keep it secure by properly shaped disks, one of the size of the neck and the other larger and of the size of the bottom of the bottle.

The adjoined figure shows one way to attach the rubber producing the friction by attaching it to the top of two massive glass rods, solidly attached to the supporting table. This method labors under the objections that it is expensive and that it is difficult to produce sufficient pressure of the rubber to the glass cylinder without danger of dislocating the attachment of the glass rods to the table and to the rubber. The advantage is that the rubber is well insulated and will show negative electricity when the prime conductor, seen at the other side of the cylinder, is connected to the ground and, *vice versa*, positive electricity in the prime conductor when the rubber is connected to the ground. These connections are necessary in order to obtain strong charges, as without them only very small amounts of electricity can be obtained.

Another cheaper, simpler and more reliable method is to have the bottle revolve in a square frame, made of four boards, the side-pieces of which in their centers support the axis, while the rubber is kept in position from the top and bottom pieces by silk cords which are placed in such a way that when stretched by adjustable pegs they produce the necessary amount of friction to be found by trial.

Such a machine was made by the writer in his boyhood (1828); he was encouraged to make one by finding in the attic of the house the remnants of one which had been made by his grandfather and, according to family tradition, had once produced electric symptoms. An old suitable bottle was given to him for nothing, and he prepared to make a suitable wooden frame, consisting of four boards, one for bottom and one for the top, of suitable length to give place for the bottle and two uprights to support the axis. The only help he required was given by an old experienced chemist, who chipped the hole in the bottom, and a mechanic, who turned the round parts of the axis, as at that time he possessed no lathe. Some of his old friends thought it a great piece of folly and pretention for a boy to make an electric machine, and he was laughed at; but it was one of his earliest triumphs in electric pursuit, when he did avenge himself on his detractors and made them join hands and gave them all a very sharp shock by the Leyden jar he had attached to his machine. This shock was so unexpected that one of the sufferers turned round and knocked the man down who happened to stand behind him, thinking that he had hit him between the shoulders.

The cost of such a machine is between 50 cents and $1, including everything, except the time a boy has to spend before he has it operating successfully.

The rubber is covered with stuffed leather which is rubbed with mussif gold (sulphuret of tin); this is far better than the amalgam which he used and is recommended in the old text-books; it is applied to that part of the surface where it touches the glass. It should be connected to the ground by a metallic chain so as to supply continually the positive electricity of which it is robbed by the friction of the glass bottle, and with which its surface becomes charged. This is absorbed by points with which the prime conductor is provided, as seen in the adjoined figure of the cylindrical machine. This conductor may be supported by two glass tubes, provided they are thoroughly dried inside with hot sand, then cleaned and the opening above and below closed by sealing wax.

It is, indeed, a satisfaction to reconstruct with small means a machine with which our ancestors received the first knowledge of a science which, within 150 years, has outgrown the most sanguine expectations, and has culminated in the modern dynamo, which is not only the most wonderful of all machines ever constructed and the greatest triumph of human ingenuity, but also a striking confirmation of what Lord Bacon announced as a maxim, that all that man knows, all he can know and all the progress he can make, is by close observation of natural phenomena and the intelligent deductions he can make therefrom.

Before the invention of the Leyden jar, it was attempted to increase the manifestations by using very large conductors; this is represented in Plate N, which also represents the friction machine as it was first made, anterior to that represented in Plate C, page 113, taken from Krayenhoff's book. At the right hand side is (Fig. 5) an improved insulating stand with glass legs, in place of the rosin tub of Desagulier, represented in Plate B, page 113.

Fig. 3 shows the construction of the axis intended to hold the perforated glass plate.

Fig. 4, under the table, represents on a larger scale the rubber with its screw arrangement intended to regulate its pressure on the glass disk, while the chain connecting it with the ground is not forgotten at the left. The remaining details need scarcely any explanation.

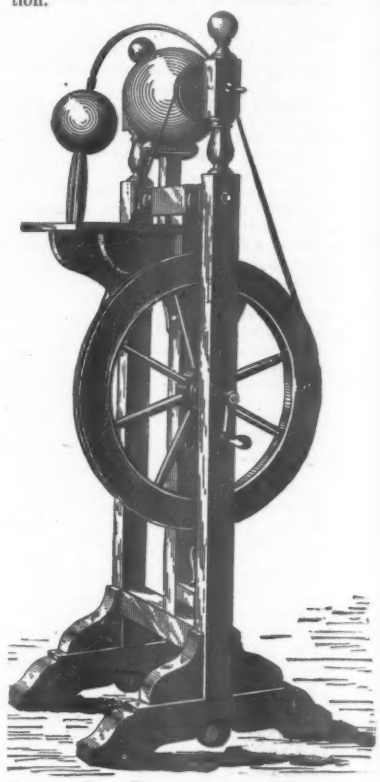


PLATE L. — ENGRAVING OF BENJAMIN FRANKLIN'S ELECTRICAL MACHINE, THE OLDEST IMPROVED FORM FOR PRODUCING ELECTRICITY FOR EXPERIMENTAL PURPOSES.

Large conductors can, of course, hold more electricity than the smaller ones and, consequently, give larger sparks, especially when they are drawn, not from the middle, but from the ends. They are also represented on an enlarged scale at the upper part of Plate O. Such kind of large conductors contain their charge only on the surface; to prove this, a brass globe is made containing a wide perforation going to its center, from which

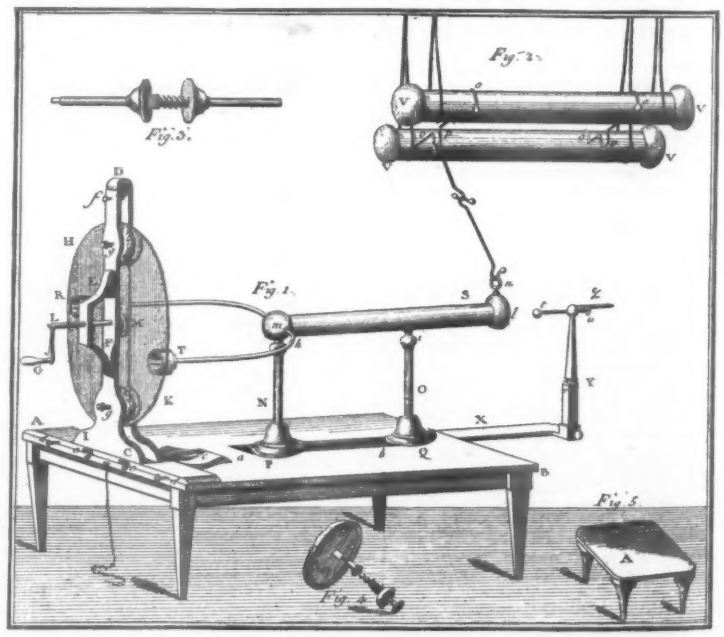


PLATE N.—DISK MACHINE OF PLATE-GLASS, THE SECOND IMPROVEMENT WITH ACCESSORIES.

center no trace of a charge can be obtained, while the surface gives very strong indications of the charge.

This law holds only for such electricity as has a pressure so high as to be measured by many thousands of volts and of very small quantity, as is the case with the friction electricity under discussion, of which the pressure is measured by meg-volts and the quantity by micro-amperes. In the case of galvanic electricity, the current passes

through the whole mass because in this kind the quantity is large and the pressure very small, while in the case of lightning there is plenty of pressure and quantity both, so that it discharges through the whole mass of a lightning rod, wherefore the hollow lightning rods are a delusion based on the behavior of small amounts of harmless friction electricity, which has very little in common with the deadly currents flashing from the clouds during a thunderstorm.

Plate O represents a battery of Leyden jars as it was usually arranged a short time after Musschenbroek went through his experience in that line.

We give, also, a reduced reproduction of an engraved portrait of Petrus van Musschenbroek as it is published in his famous book, in two large volumes, in which he devotes a whole chapter to electricity alone. It shows how, in that period of the world's progress, it was supposed to be necessary to increase the respect of the students for the professor by adorning him with a large wig, as they do still in England with the judges. With us manhood has progressed far enough to be able to estimate a man according to his merits and consequent position in society, without masquerading him. If now-a-days with us a professor entered his lecture room dressed like Musschenbroek, or a judge entered the court with such a headdress, he would be laughed at by the students and by the attendants of the court room.

It appears from the correspondence kept by Musschenbroek with his friends in Germany and France, that originally he attempted to make a storage battery with flasks half filled with water. This was an invention and executed by him and his assistant Cuneus, but the discovery to which it led was much more important than the invention. The discovery was the violent shock produced and was first made by Cuneus, and both he and the professor got a much larger dose of electricity than they expected, and the action of the Leyden jar was discovered (not invented). The jar itself was an invention made with quite different expectations.

For further information about the construction of the Leyden jar, see ELECTRICAL REVIEW for September 12, page 28. If it is found that the quality of glass is not well adapted for a good charge, it may be improved by coating it outside and inside with an alcoholic solution of shellac, applied before coating it with tinfoil.

I should not omit adding that General Krayenhoff (referred to in ELECTRICAL REVIEW for Oct. 17, page 117), in place of having such batteries of many connected jars, used single ones of such large a size as it was possible to make them in first-class glass works, which was almost the size of a flour barrel. They were found to be far superior than the compound batteries, in which there is too great a chance for loss by radiation from the many connections and by the charge creeping from the inner to the outer coating over the surface of the glass, as in large jars the distance of the two coatings can, of course, be made much larger than with small jars.

Wanamaker's Postal Telegraph and Telephone.

In Postmaster-General Wanamaker's annual report, published on December 4, he renews his recommendation for the division of the country into postal districts, and adduces many reasons why the reform would be beneficial. He shows that the county seat visitations have resulted in the submission of 2,100 reports out of a possible 2,800, and that the condition of 45,600 offices is covered. Two of the most interesting items which every county seat postmaster was asked to report upon were the distance from the post office to the nearest telegraph office, and the distance to the nearest savings bank. These distances, reported in various terms of feet, blocks, rods, yards and miles, have been reduced to a common term and averages struck of the various parts of the country with the following results:

New England States—Average distance to the nearest telegraph office, four miles; average distance to the nearest savings bank, 10 miles.

Middle States—Average distance to the nearest telegraph office, three miles; average distance to the nearest savings bank, 25 miles.

Southern States—Average distance to the nearest telegraph office, 9 miles; average distance to the nearest savings bank, 25 miles.

Western States—Average distance to the nearest telegraph office, 7 miles; average distance to the nearest savings bank, 26 miles.

Pacific Slope States—Average distance to the nearest telegraph office, 13 miles; average distance to the nearest savings bank, 52 miles.

Hundreds of postmasters were willing to incur great personal expense and trouble, and almost every one submitted suggestions which are now receiving the careful attention of the proper departmental officials.

The postmaster-general recommends this year the adaptation of the telephone, as well as the telegraph, to the postal system, holding that it is not only the constitutional privilege, but the duty of Congress to utilize all the means of modern science for quickening the transmission of intelligence. He says upon these two points:

"A year from next March the telephone patent expires, and, unless Congress acts promptly to authorize its adoption for communication among the people, it requires no stretch of the imagination to believe that in the next two years one immense syndicate will unite and control all the hundreds of telephone plants of the country, as the telegraph is now controlled, or the two will be united, and then, for the next 20 years, the most astute attorneys will be legitimately earning large salaries in indignantly opposing the so-called attacks of future postmaster-generals upon defenseless vested rights.

"One-cent letter postage, three-cent telephone messages and ten-cent telegraph messages are all near possibilities under an enlightened and compact postal system, using the newest telegraphic inventions. The advantage of tying the rural post office by a telephone wire, requiring no operator, to the railroad station must be obvious. The benefits arising from telephonic connections with the post offices will easily suggest themselves in a hundred ways to those who want the entire people to share in common privileges.

"It is not chimerical to expect a three-cent telephone rate; the possibilities of cheapening the management of these new facilities are very great. All account keeping could be abolished by use of stamps or 'nickel-in-the-slot' attachments. Collection boxes everywhere in the cities, and many places in the country towns, would receive telephone and telegraph messages written on stamped cards like postal cards. The system recommended would not forbid private telephones or telephone exchanges in cities any more than it would exclude the use of the telegraph by railroads having their own lines. The plan contemplates only the convenience of the people in the use in common of their own post office as the neighborhood station for telephoning and telegraphing. They have a right to claim this, as not a penny of additional expense is necessary for rents, heat, light, or attendants for telephonic service.

"No one will boubt, in the light of the events of the day, the wisdom of the government exercising some authority over the trans-Atlantic cables, whose right to land on our shores is only by government consent. There are also many who question the safety of submitting to any private corporation of capitalists the subjects of reciprocity, arbitration, movements of naval vessels, etc., in messages passing to foreign governments from time to time, as well as messages of citizens affecting great financial an commercial operations, especially when the same corporation is a large seller of news to the Associated Press."

PLATE P.—PORTRAIT OF PETRUS VAN MUSSCHENBROEK. HE ATTEMPTED TO INVENT THE STORAGE OF ELECTRICITY, AND DISCOVERED THE SHOCKING LEYDEN JAR.

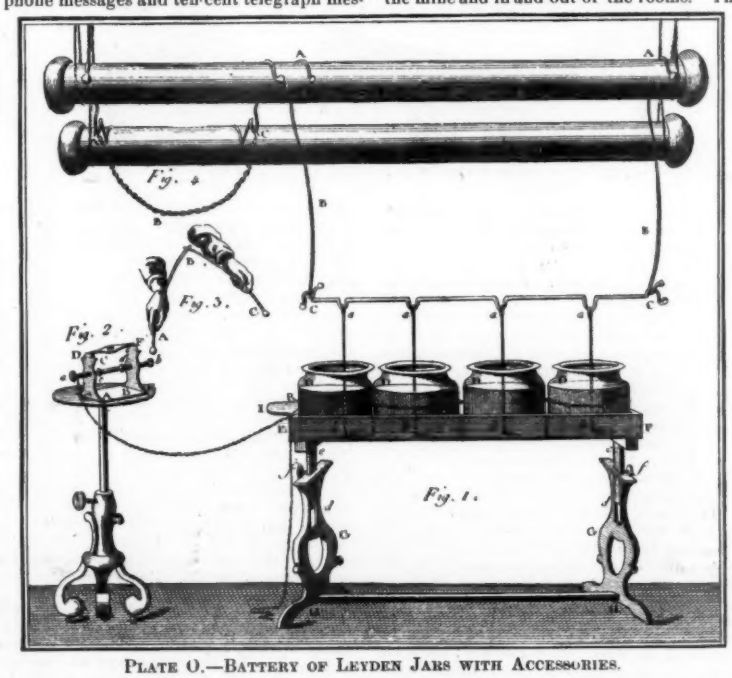


PLATE O.—BATTERY OF LEYDEN JARS WITH ACCESSORIES.

A New Coal Undercutting Machine.

The undercutting of coal by machinery is an important problem for the mining fraternity. The undercut may be made by hand, but this method not only adds largely to the expense of mining coal, but also makes a large quantity of fine coal or slack, which is comparatively a waste product, except in certain cases. A successful machine not only cheapens production, but also increased output, insures the mining company in a large measure from delays and shut downs incident to strikes of ordinary miners, and simplifies mine management. There are several types of machines on the market and in actual operation, but the one herewith illustrated works in an entirely different line from other machines.

The New Arc machine consists of the following parts: A heavy iron base cast in one piece serves as a foundation for all the parts carrying two pairs of axles, one at right angles with the other. The gauge of one pair is fixed to suit the regular track gauge of the mine wherein the cutter is to work, and these axles carry small flanged wheels upon which the cutter is easily moved about the mine and in and out of the rooms. The second pair of axles carry small wheels for supporting the cutter when in actual operation and carrying it along the face of the wall being cut. They are not flanged, but are kept upon the track by two pairs of single and two pairs of double guides, as shown in the illustration. The support of the machine is easily changed from one pair of axles to the other by means of a cam worked by screws, the larger flanged wheels being raised out of the way when the cutter is in actual operation, as shown in the illustration on page 228.

The motive power is furnished by a 15 horse-power motor, which in the latest machine is somewhat changed from that shown, the motor being perfectly water tight and thoroughly protected from all danger of mechanical injury. The armature shaft carries a beveled pinion at each end. That nearest the commutator is made to engage, by reason of a controlling arm, either one of the two beveled gears shown in the illustration, thereby giving the shaft on the right a right-handed or left handed rotation. By means of the chain of gears and an ingenious mechanical device, this shaft operates the feed chain at practically any desired speed. The feed chain is made fast to a post ahead of the machine, and in this way the cutter is drawn forward at a speed under control of the operator, and which can be varied with the hardness of the coal. The same gearing, by means of another controlling lever, is made to move the arm from a position alongside the machine at the beginning of the cut to the position shown in the illustration, where it is held rigidly during the remainder of the cut. The second pinion on the armature shaft operates the endless chain carrying the cutting knives about the arm. The controlling devices are such that the cutter may be held stationary while the knives are in operation, an important point in cutting through particularly hard formations. The length of the arm carrying the endless chain is made to suit the requirements of the mine in which it is to operate, the undercut usually being made of depth equal to the thickness of the vein.

The length of the arm is adjustable within certain limits in order to take up the stretching of the chain due to wear. The chain and knives are drop forged and of a strength to withstand the hardest usage. The knives are easily detachable from the chain, so that a new set of sharp knives may be substituted for the old set in a very short time. The track along the face of the work consists simply of two rails with an iron cross tie, and may be laid and removed in a very short time and with a small amount of labor. By the use of this track and this type of machine the necessity for moving a heavy piece of apparatus by hand, oftentimes in a very low room, is avoided, a very important point, as any one who has had experience in these matters can testify. For its operation the cutter requires two men, one of whom is at the machine controlling the rheostat and operating devices, and the other keeps the track laid ahead and sets posts for anchoring the feed chain. All trouble with the slack clogging up the cuts is obviated, as the knives themselves bring nearly all the slack outside the cut, leaving a clean space.

The machine is thus seen to possess very important advantages in all kinds of working, and for large room working, or a long wall system, these advantages become all the more prominent. It is operated on a 220 volt circuit making it entirely harmless electrically. It is handled by the Thomson-Van Depoele Electric Mining Company, No. 620 Atlantic avenue, Boston, to whom should be addressed all inquiries regarding it.

TELEGRAPHIC

.... The test office receipts of the Western Union Telegraph Company last week were $265,800, against $261,300 a year ago, an increase of $4,500.

.... The Postal Cable Telegraph Company has completed its line from Savannah to Charleston. The country roads have been used instead of following the railroad, and cables have been laid under the Savannah and Bach rivers. The cable crossing the former is 1,500 feet long and the latter 2,500 feet long.

.... The city of Allentown, Pa., has scored a victory against the Western Union Telegraph Company in a suit for $300, the amount of the tax on poles maintained by the company in the city limits. About seven years ago the council passed an ordinance imposing a tax of $1 per year for each pole maintained by electric light, telephone and telegraph companies. All these corporations but the Western Union paid the tax, and in 1888 suit was brought against the company for the taxes on 75 poles for four years. The case was tried in court last week, and the jury rendered a verdict in favor of the city for the full amount. The telegraph company made the claim that the tax was illegal.

* * The trolley system has taken the place of the cable on one of the principal street car lines of Denver, Colo.

* * Special rails are now being laid on a portion of the Fourth avenue road in this city, preparatory to the introduction of electric cars.

* * An electric street railway company has been organized at Kenosha, Wis., with a 20 years' franchise, and will begin work on their lines at once.

* * A syndicate has been formed to utilize the great Trollhatta waterfall, near Gothenburg, Sweden, for the working of mills and factories in that town by electricity. It is estimated that 10,000 horse-power will be produced.

* * The Second Avenue Passenger Railway Company's car barn at Glenwood, near Pittsburgh, was burned November 26. Twenty-five electric cars and the building were destroyed. Loss, $130,000; insurance about one-half.

* * Favorable reports have been made by the Tacoma, Wash., council on ordinances granting the Tacoma Railway and Motor Company privilege of carrying freight over its line of electric and cable street railway and to furnish electric power.

* * A scientist of Berne has been studying the subject of the water power that can be made available in Switzerland for the generation of electricity for light and power, and finds that 600,000 effective horse-power can be obtained without difficulty.

* * The Robinson Electric Railroad, of Toledo, O., have just received 20 new motors which will be put in use at once; also a new 150 horse-power generator for the power house. A third generator of the same power will arrive in a few days and also be put into action.

Annual Report of the Naval Inspector of Electric Lighting.

NAVY DEPARTMENT,
BUREAU OF EQUIPMENT,
WASHINGTON, October 30, 1891.

Sir: During the past year the installation of electric lights on board of the United States receiving ship "Vermont" was completed and the electric plants on board the United States steamships "Boston" and "Dolphin" received extensive repairs, that on the latter vessel being almost entirely renewed, the situation of the dynamo room being changed with good results. The electric plants on board the United States steamships "Newark," "Concord," "Bennington" and "Miantonomoh" have not been completed according to the specifications, although all but the latter vessel are in commission. In the case of the "Newark," the Thomson-Houston Electric Company having the contract for the installation, the generating sets have not met the specifications in that the dynamos are not properly compounded, and the heating limit allowed has been largely exceeded, and no search-lights have been furnished; it is hoped, however, that these defects and deficiencies will, before long, be made good. In the case of the "Concord" and "Bennington," the generating sets have, after repeated trials, failed to pass a satisfactory test, and are to be replaced by others of a different type as soon as the contractors, the Edison General Electric Company, can manufacture the same. With the exception noted, the rest of the installations on these vessels have been completed in accordance with the Bureau's requirements. The Brush Electric Company, the contractors for the "Miantonomoh," have not completed the electric plant of this vessel, the failure being with the dynamos. Early in the Summer one generating set of 200 amperes of the Thomson-Houston manufacture was installed and the wiring of the vessel practically completed. At the request of the contractors the department consented to change the capacity of the second generating set from that of 400 amperes, called for by the specifications, to one of 200 amperes, which, however, at this date has not been installed.

The coast defense vessel "Monterey" is receiving an electric plant, which is being installed by the contractors of the vessel.

Specifications have been prepared for electric lighting plants on board the "New York," Cruisers Nos. 9, 10 and 11, Gunboats Nos. 5 and 6, harbor defense ram, practice cruiser, and Torpedo Boat No. 2. These vessels, with the exception of the latter, are well advanced in their construction, and the work of the installation should begin at an early date, the contract for Cruisers Nos. 9 and 10 having already been awarded by the contractor to the Edison General Electric Company.

As the U. S. S. "Maine," "Texas," "Raleigh," and "Cincinnati" are being built by the government at its navy yards, their electric plants will be installed by government labor. Contracts for the greater portion of the material required have been made, and it is expected that the work of installation on board of these vessels will commence this year.

Specifications for Cruisers Nos. 12 and 13 and the battle ships "Massachusetts," "Indiana" and "Oregon," are being prepared.

As soon as the construction work on the monitors "Puritan," "Amphitrite," "Monadnock" and "Terror," will permit, the work of placing in these vessels suitable electric plants will be commenced. A portion of the material required for these vessels will soon be available.

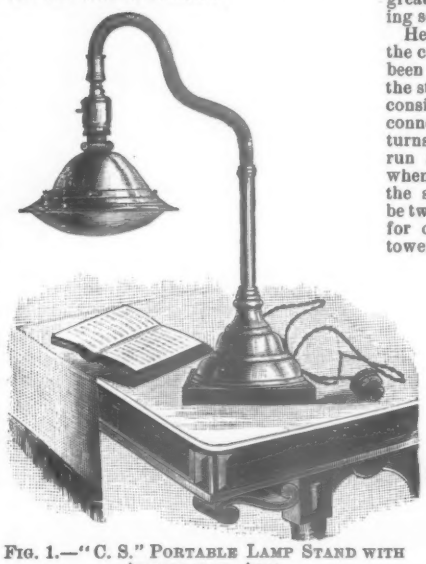


FIG. 1.—"C. S." PORTABLE LAMP STAND WITH ADJUSTABLE ARM.

The multipolar dynamo of Edison design, heretofore supplied by that company, has not given upon trial the satisfaction expected or merited the favorable opinion originally entertained. Recognizing its unsuitability for naval work, the Edison General Electric Company have recently brought out a new design, and are now under contract to supply a number of generating sets. In designing these sets economy of space and weight have been considered, the armatures being mounted upon the engine shaft, thus dispensing with all couplings and reducing the number of bearings. The external field will be minimized, and the whole set of much simpler design than any set supplied in this country for naval purposes.

With a view to securing greater efficiency, it is intended that the lighting system on board of the new vessels shall be divided into three parts; first, night circuits, where artificial light is only needed through the night; second, day circuits, when artificial light is needed at all times; and, third, battle circuits, which includes the necessary lights for working the vessel during action; these circuits to be controlled from the dynamo room.

As the plants on the vessels lighted by electricity have been installed by different companies, the material being the output of different manufacturers, there is a want of interchangeability in the fittings, and to a great degree each vessel is independent of others, particularly in regard to stores, thus requiring a great variety of supplies of the same article to be kept. Steps have been taken to correct this by the adoption of a standard naval holder for incandescent lamps, which will in time allow the same lamp being used on all vessels. The great variety of light fixtures have been reduced one-half, and the parts made interchangeable by the adoption of standard electric light fixtures. By the utilizing of lamps on board ship to light contiguous spaces, the number of lights required has been reduced.

SEARCH-LIGHT.

A contract for a number of these projectors having been made with the Thomson-Houston Electric Company, it is expected that in fulfilling the same the government will receive a superior article, with a power equal to any that are afloat.

Search-lights are of value not only for war and navigation purposes but can be utilized for signaling, and, in cases of emergency, such as the upsetting of a boat, man overboard, etc., they will be found of great assistance; for, if the crew are trained in their use, a quartermaster, signalman, or other person in the vicinity of the light, could turn its rays in the direction of and illuminate the scene; this act would inspire hope and courage, besides materially aiding in the relief and rescue of the unfortunates.

SIGNALING.

The vessels on the north Atlantic station and in the squadron of evolution have been equipped with the Ardois system of electric night signals, and it is expected that after extended use with this system, which is regarded with much favor abroad, some system of signaling will be devised that will satisfy the needs of the service.

INTERIOR MEANS OF COMMUNICATION.

The demand for reliable telegraphs for transmitting orders from the controlling stations to the main and steering engines, and for efficient indicators showing directly the number of revolutions of the propellers and the angle of the rudder, is still unanswered. Asseveral parties have undertaken to meet this requirement, it is to be hoped that before long vessels can be provided with the necessary instruments which will greatly facilitate the handling of ships during squadron manœuvres.

Heretofore mechanical telegraphs between the controlling stations and the engine have been employed with good results, but when the structural features of the new vessels are considered, it will be found that mechanical connections, where long leads and many turns are encountered, will be difficult to run and operate; this will be emphasized when additional connections are made with the system. In modern vessels there will be two controlling stations, one on the bridge for ordinary use, and one in the conning tower for action; it is also deemed by some necessary to have means for controlling the vessel from other points, such as the pilot-house and some suitable location aft; and unless independent means be supplied for each station, connection must be made with the main telegraph—that from the bridge to the engine room. Where independent means are given to each station, the result will be the multiplication of parts, with the attendant increase of weight and absorption of space.

The purely mechanical methods only communicate certain conditions, such as, "stop," "stand by," "slow," "half speed," "full," and not the number of revolutions a necessity in manœuvring.

It is considered very desirable to know in return the actual speed being made by the engine, and that without human aid; hence, the necessity for direct reading indicators that will show the direction and speed of a propellor at a glance. The same reasoning is applicable to the control of the rudder.

If the same efficiency can be obtained with different systems, then the one most easily worked, requiring less space and less weight, due regard being had to original price and cost of maintenance, should be preferred.

The experimental telephone circuits introduced by the American Bell Telephone Company on board the "Philadelphia" have given satisfaction, particularly the one not exposed, and it is thought that the difficulties in the case of the exposed circuit are such as to be easily corrected.

Voice pipes, where exposed, have been made more serviceable by the attachment of the mouth pieces to short lengths of flexible tubing that is kept attached to the fixed tube, and for use is drawn out, enabling the mouthpiece to be brought into close proximity to the mouth or ear; this plan permitting use of the eyes at the time of receiving or transmitting a message, and doing away with the necessity of stooping, has contributed towards the efficiency of these pipes; still the space occupied, the weight of, the difficulties of installation with the number of unavoidable bends and turns, impair to a great extent their value.

The recommendations contained in the last report I beg to renew, believing that the experience of the past year has but strengthened the demands, viz. that the rate of electrical machinist be established, the pay to be such as will attract and compensate suitable persons, the rating to be opened to any enlisted man possessing the necessary qualifications; and also that the services of a draughtsman be secured. While the work of standardizing the different parts connected with the electrical plant of a vessel is going on, and to meet the constant demands of manufacturers and contractors for drawings of standard articles, the services of a draughtsman should be available without depending upon the courtesy of other bureaus.

I feel it to be not only a duty but a pleasure to express my appreciation of the services rendered by the officers engaged upon this special work, and to bring to your notice the ability, commendable zeal and cheerfulness, displayed by Lieuts. Wainwright Kellogg, Lucien Flynne, Hamilton Hutchins and Lieut. (J. G.) A. W. Grant; Ensigns E. F. Leiper, J. J. Blandin, H. A. Field and J. W. Oman, in the performance of their duties. To Ensign Blandin, an officer of marked ability, energy and good judgment, I am especially indebted for aid in the preparation of specifications and the performance of duties connected with the office. Respectfully submitted,

J. S. NEWELL,
Commander United States Navy, Naval Inspector Electric Lighting.
The Chief of the Bureau of Equipment.

New "C. S." Specialties.

The cut, Fig. 1, illustrates a portable lamp stand with adjustable arm, now being put upon the market by the Cutter Electrical and Manufacturing Company, 27 South Eleventh street, Philadelphia.

The cut represents the stand, mounted and wired, to which is attached a combination reflector shade; also a product of this company, a description of which may be found below.

The stand consists of an upright metal tube mounted upon an ornamental base of spun metal and marble. From the upper end of this standard projects a hollow flexible arm, to the end of which is affixed the ordinary lamp socket.

This flexible arm is so arranged that it may be bent in any direction or coiled upon itself if desired, and in whatever position it be placed, there it remains steadfast, until it is desired to place in another position.

The stand is wired by means of a fire-proof flexible cord, which enters the fixture through an ebonite sleeve placed in the ornamental base, and then passes up through the standard and the flexible arm to the lamp socket. The interior construction of the flexible arm is such as to protect the conducting cord from being crushed or abraded, however the arm may be coiled or bent, and it is, withal, practically indestructible and will always remain in any position into which it may be set, no matter how often it may have been previously bent or coiled to and fro. This flexibility of the arm enables the user not only to concentrate his light upon any desired point at will, but it permits him in so doing to form the arm into almost any graceful curve that may be suggested. This flexible arm is also modified into a wall bracket which may be curved or coiled into any desired form.

FIG. 2.—"C. S." LAMP SHADE.

The lamp shade, Fig. 2, which is about to be put upon the market by the same company, presents some unique claims to favor. It will carry any size or style of lamp. It is provided with its own shade holder which is adapted to automatically fit any and all systems. It permits the renewal of an exhausted lamp with the least expenditure of time and trouble. It directs the light exactly where it is wanted and to no other point.

It is made of aluminum and glass, weighs less than five ounces and may be "knocked down" and "nested" for shipment.

It has but one destructible part, the glass diffusion plate, which, if accidentally broken is easily replaced at a trifling cost.

Briefly, this reflecting shade may be described as a combination of a parabolic with a plane radiating reflector to which is attached a diffusion plate of ground glass, and the arrangement of these different parts is such as to direct the main portion of the rays of light into a given zone of illumination, while a minor portion is radiated and diffused throughout the room.

The cut shows the shade with automatic shade holder attached.

This reflecting shade is particularly well adapted to the portable lamp stand or bracket.

A Model Electrical Plant for the Siemens & Halske Works at Charlottenburg.

The Charlottenburg works of Siemens & Halske (just out of Berlin, Germany) is, probably, the largest of its kind in Germany, and has one of the most complete electrical plants for furnishing current for light and power in the works that can be found in the world. This firm has several large factories, besides the one at Charlottenburg, one in St. Petersburg, Russia, and one in Wien, Austria, employing over 1,000 men. The works

FIG. 3.—BOILER ROOM OF SIEMENS & HALSKE ELECTRICAL PLANT AT CHARLOTTENBURG.

in Berlin employs 1,000 men and that at Charlottenburg 1,600 men. The firm has a pay roll for more than 4,000 men. At Berlin only telephone, telegraph, signal apparatus and incandescent lamps are manufactured, while in Charlottenburg and the other factories, dynamos, motors and other apparatus used in central station work are made. The works in Berlin occupy nearly a whole block near the center of the city and turn out daily over 4,000 incandescent lamps of candle-power ranging from 10 to 50, or a total of 1,000,000 lamps per year. The life of these lamps is guaranteed at 1,000 hours, although lasting much longer in practice. One hundred telephones are made daily, as well as a large number of signal gongs, blocks and telegraph apparatus, 30,000 having been furnished to the government, as well as a total of 2,000 complete telegraph sets per year.

Herr Vogel, director of the Charlottenburg works, sails for America shortly to make arrangements for their exhibit at the World's Fair, which will be one of the largest, if not the largest, foreign exhibit at the Exposition in Chicago in '93.

The electrical plant below described was designed by Herrn Hofbawrath Ihne, and is so well arranged that a careful study of the arrangement will be of interest. The current generated is used for lighting the offices, all of the different shops and winding rooms of the works, both with arc and incandescent lamps, and also to drive electric motors in the machine shops. Many of the lathes, planers and winders are driven by separate electric motors, and those that are not so equipped will be so arranged during the coming year. There is also an electric coupling on the main shafting in each department, which, when operated by pressing a button in any part of the shop, cuts off the current from the electric motor and sets an electric brake, stopping the entire shafting in a very short time in case of an accident.

In the boiler and engine house there are several rooms, all of large size and well lighted. Besides the boiler and engine rooms, an accumulator room and meter room, in which there are 20 or 30 meters of the type of Dr. H. Avon, of Berlin.

The boiler room, Fig. 3, has place for four boilers, of which, at present, only two are in position. These boilers each have a heating surface of 80 square metres; they were furnished by the well-known firm of H. Pauck, in Landsburg, a. W. These boilers work at a pressure of 10 atmospheres, each furnishing the necessary steam for driving one of the steam dynamos and heating the buildings of the stations. There are two feed water heaters which deliver the water to the boilers at 100 degrees C. Two injectors and one steam pump for supplying the boilers with water.

Near the boiler house is the engine room, Fig. 4; it is six and one-half metres high, and is built of white sandstone. It has foundations built for three steam dynamos. At present only two are in operation. These steam generators have each a maximum capacity of 250 horse-power. The dynamos are of the Siemens & Halske inner pole type, and are directly coupled to two triple expansion condensing engines of the firm Maschinen-fabrik von. F. Schichau, in Elbing. These engines are of the vertical marine type and have the highest recommendations, several having been furnished by the above firm for the torpedo boats of the Russian and Italian fleets.

The normal capacity is 200 horse-power, with a maximum of 250 horse-power, at 145 revolutions per minute and at a pressure of 10 atmospheres. They also are guaranteed to use only six kilogrammes of steam per indicated horse-power per hour.

The dynamos are of the six pole field magnet type already described in several papers in connection with the Siemens & Halske exhibit at Frankfort Electrical Exposition.

The capacity of each of these machines is about 200,000 watts at 110 volts.

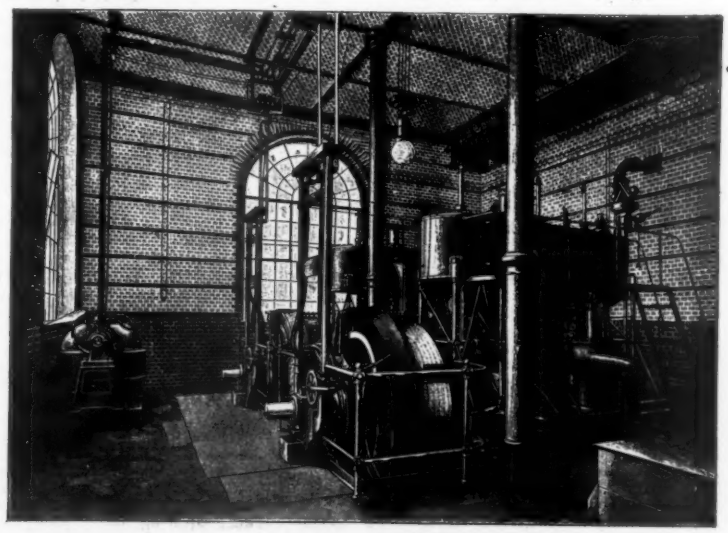


FIG. 4.—ENGINE ROOM OF SIEMENS & HALSKE ELECTRICAL PLANT AT CHARLOTTENBURG.

A direct current is also used for keeping the potential up in charging the accumulator plant, Fig. 1. It consists of two double pole direct current machines on a single base casting, *i. e.*, it has two fields and two armatures on the same shaft. The speed of the armatures is 800 revolutions per minute. Now, one-half acts as a motor and the other as a generator. The current from the generator is used in connection with the large machines for charging the storage batteries, *i. e.*, it transforms the current with 110 volts to one ranging anywhere from 0 to 70 volts, so that by the aid of this transformer the current for charging the storage batteries may be varied from 110 volts to 180 volts, from beginning to end of charge. Also, in the discharge of the batteries, the transformer may be reversed, and what was a motor before, running at 110 volts and 260 amperes, now runs as a dynamo generating current at that potential, while the part of the machine which before generated a current of 420 amperes at 70 volts, now acts as a motor and drives the 110 volt armature as a dynamo.

The accumulator room adjoins the boiler room and contains a plant of 66 cells of the Tudor system. They were furnished by the Akkumulatoren-fabrik Aktien-gesellschaft.

The battery has a capacity of 1,400 ampere hours, with a discharging current of 400 amperes. The accumulators are arranged in three rows of wooden trays with glass insulators between the elements. The first 23 cells on the positive side are connected to the double cell circuit charger.

On the north side of the engine and dynamo room is the switchboard, Fig. 2, with the instruments mounted on marble slabs. It has all of the necessary switches, volt and ammeters mounted upon it, as well as the zellen schalter and automatic cut-outs for the accumulator cells.

There are in the complete installation 188 arc lamps with current ranging from 4.5 amperes to 20 amperes; 1,504 incandescent lamps of 10 to 25 candle-power. There are only 21 electric motors now in operation, but more will be added as soon as the extra boilers and engines are in operation. The motors now used range from $\frac{1}{10}$ horse-power to 20 horse-power. It is expected that within a short time the third boiler and steam dynamo will be in place and then the plant will be omplete.

Berlin, Dec. 1. FRANK C. PERKINS.

The American Chemical Society.

In accordance with a resolution of the Society, approved by the board of directors and advisory council, and in response to an invitation from the members residing in New York and vicinity, it has been decided to hold the fourth general meeting of the Society in New York city on December 29 and 30, 1891. A committee of arrangements has been appointed and further announcements of the meeting will be made at an early date. A cordial invitation to this meeting is extended to chemists, chemical manufacturers and to all persons interested in the progress of chemistry.

The Weston Standard Voltmeter in Germany.

W. Le Conte Stevens writing to Mr. Edward Weston, vice-president of the Weston Electrical Instrument Company, Newark, N. J., says that the Weston standard voltmeter is held in very high esteem in Germany. At a lecture recently attended by him at the polytechnic school, in Zurich, the lecturer, who was a member of the testing commission at the recent Frankfort electrical exhibition, said he had subjected the Weston voltmeter to various tests and found it in the highest degree satisfactory. As an illustration of the excellence of the magnet employed, he stated that an instrument having fallen accidentally upon the floor, its subsequent indications were not affected more than one-half of one per cent. by the mishap. The Weston Electrical Instrument Company are very busy.

ELECTRIC LIGHT NEWS

—— The Allegheny County Light Company, has secured the contract for lighting the city of Pittsburgh. The contract runs for four years from January 1, 1892.

—— The Worcester, Mass., electric light plant is to be equipped with a new Corliss engine of 600 horse-power. The fly-wheel is 22 feet in diameter with a belt surface of 62 inches.

—— The Thomson-Houston Electric Company have a large force of men at work at Hopkinsville, Ky., erecting poles preparatory to stringing wires for the electric light system of the city.

—— The Central Electric Company report a large increase in their lamp business since they have taken the agency for the Swan lamp. The 16 candle-power lamp of the Swan make has an efficiency of between 3.3 and 3.4 watts per candle-power, and an average life of from 600 to 1,000 hours, and does not blacken even when nearly burned out. The company claims that the demand is for high efficiency and good average life, rather than low efficiency and extra long life.

—— The fight between the city of Cleveland, O., and the gas companies, over the 60 cents gas ordinance, took a new phase last week, when a resolution was introduced in the council requesting the General Assembly to authorize the city to issue bonds in such sum as may be necessary to establish and maintain a gas and electric light plant. The Director of Public Works was also requested to ascertain the cost of such a plant. The resolution went over for a week. Public opinion favorable to such action is growing in strength.

—— The Jenney Electric Light and Power Company held its annual meeting last week at Fort Wayne, Ind. The company is in good condition and is acquiring a success almost unexpected. The annual election was held at which time the follow board of directors and officers were chosen: Directors, H. C. Graffe, R. T. McDonald, A. E. Hoffman, G. W Pixley, E. Gilmartin, M. W. Simons, J. H. Bass. The officers chosen are: H. C. Graffe, president; R. T. McDonald, vice-president and general manager; A. E. Hoffman, secretary; G. W. Pixley, treasurer.

The Demand for Street Railway Trucks.

The McGuire Manufacturing Company, of Chicago, manufacturers of street railway trucks, report an increase in the volume of their business for the current year over 1890 of over 35 per cent. Their works are running night and day and still they have difficulty in keeping up with their orders.

Recently, they accepted an order for 30 of their maximum traction trucks and 15 of their steel frame No. 19 B. trucks, from the San Francisco & San Mateo Street Railway Company, for delivery in 20 days from date of order, on board the cars in Chicago, under penalty of $50 per day for any default in time. When it is considered that their capacity is ten trucks per day, it is an evidence of the popularity of their truck and the manner in which their orders are pushing them, that a penalty is required to insure prompt delivery. It is also an evidence of the facility and speed with which electric street railways are constructed and equipped. This method for local transportation seems destined to supercede all others.

The two styles of truck mentioned above were first introduced by the McGuire Company the early part of this year and the large increase in their business is, undoubtedly, due to the approval they have met with at the hands of street car men generally.

The points of value in their trucks are fully covered by patents, nine having been issued to them during the present year, and taken in connection with their well-known reputation for first-class quality of material and skilled workmanship, a brilliant and successful future for the company would seem to be assured.

SHALL THE GOVERNMENT CONTROL THE TELEGRAPH?

(*Continued from page 218.*)

telegrams by a leased wire. Charges for any distances in Great Britain for press messages are as follows:

For every 100 words between 6 P. M. and 9 A. M., one shilling (25 cents).

For every 75 words between 9 A. M. and 6 P. M., one shilling (25 cents).

For press dispatches sent to more than one address, two pence (4 cents) for every 100 words in the night or 75 words in the day for each additional paper.

Computed for a service of 1,000 words a night, a special dispatch directed to one paper would cost $2.50; the same dispatch transmitted in the day to one paper would cost $3.33. But suppose that this service is to go to a press association of 10 papers, then the service would be for 1,000 words, night, $6.50 to the 10 papers; in the day, to the same papers, $8.13. If the service is to go to 25 papers, then the cost of 1,000 words in the night would be $12.10, and transmitted in the day, $14.85. This is less than one and a quarter cents per word night work, and one and a half cents for day work, delivered to 25 papers. In other words, each paper in an association of 25 dailies would pay only 48⅖ cents for 1,000 words of night report and 59⅖ cents for 1,000 words of day report, while 10,000 words of night report would cost $4.84, and 10,000 words of day report $5.93 per day, for each paper. This is certainly a lower rate than the most favorable contract any telegraph company has ever granted to the Associated Press or any other association.

The rate charged for leased wires in Great Britain is $2,000 per annum for a line extending to any distance within the United Kingdom, the service beginning at 6 P. M. and terminating at 9 A. M. for six nights in the week. The government furnishes the operators and instruments. Leased wire messages are delivered free at newspaper offices at a distance of one mile from the main office. Special wires can be extended into newspaper buildings by the payment of additional rental, computed on a distance basis, which would be very trifling. In this country the wire rental is computed at $10 per mile. A line 200 miles long would rent for $2,000 a year, and the paper leasing the same would have to pay for the operators, which would incur an additional outlay of $2,000 per year. A line between New York and Cleveland, a distance about the same as that between London and Glasgow, would cost $6,000 a year for wire rental and $2,000 for operators, as against $2,500 charged for the same service in Great Britain. The press service receives special care at the Paris central office, and the leased wire service is even more liberally arranged in France than in England. You can lease a wire for an hour, and even for five minutes. The rate for one hour over a wire extending any distance within the Republic of France is 30 francs, or $6, including operator's service at both ends; or 2½ francs, or 50 cents, for five minutes. The average transmission is 2,000 words an hour, and often, with very rapid presses, 300 words in five minutes. International wire service is necessarily dearer. There are, however, several international wires leased to newspapers and press bureaus. The New York *Herald* has a leased wire for certain hours between London and Paris, and the Reuter and Havas correspondent bureaus have several wires leased which are operated by them for the transmission of international press news analogous to the Associated Press reports. The French postal telegraph grants a rebate to the press for the time during which a leased press wire is in use for commercial purposes. When the press has leased wires and the government uses them in the interval when they are not in use for press despatches, the expenses are shared in proportion to the service.

In Austria the bulk of all press dispatches is transmitted by long distance telephone, which is part of the postal telegraph plant in that country. This is also true of Germany. All the press dispatches between Vienna and Prague, a distance of nearly 300 miles, are transmitted by telephone at rates computed according to the time consumed.

The salaries of postal telegraph employés in Great Britain will compare favorably with those paid for the same class of operators in this country, barring, perhaps, a dozen officials of the highest rank. The pay roll of the British postal telegraph embodies:

	Annual Salary.	Annual Increase.
1 Engineer in chief	$6,000	$250
1 Assistant and electrician	4,750	125
1 Submarine supt. at Woolwich	3,500	125
1 Superintending engineer	3,500	125
1 Assistant supt. engineer	2,250	125
13 Superintending engineers	3,000	
31 First-class inspectors	1,400	
64 Second-class inspectors	1,050	

LONDON CENTRAL TELEGRAPH STATION.

Male Staff.

	Annual Salary.
1 Controller	$5,000
1 Deputy	3,750
2 Assistants	2,500
19 Chief operators	2,000
52 Assistant chiefs	1,550
48 Second-class chiefs	1,500
170 Senior operators	950
441 First-class operators	800
1149 Second-class operators	550

Female Staff.

1 Matron	$1,150
9 Supervising operators	900
18 Assistant supervising operators	700
40 Second-class operators	550
230 First-class operators, per week	9.50
521 Second-class operators, per week	7.50
53 Pneumatic tube attendants, chiefly boys, per week	7.50

This salary list should allay the groundless fears aroused among our former associates in the telegraph service, that postal telegraphy would reduce them to starvation wages. Another feature of the British telegraph management is the retirement of aged employés on an allowance that places them beyond dependence. By the telegraph purchase act of 1868, all telegraph employés who had been in the service of the companies 20 years or more prior to the purchase, and failed to secure re-employment in the postal telegraph service, were to receive annuities equal to two-thirds of their salary, and if less than 20 years, the annuity was to be reduced by one-twentieth for every year under 20, but no annuity was granted to any employé who had served less than five years in the telegraph companies' employ. In 1891 there were on the postal telegraph payroll the following ex-employés of the telegraph companies:

7 Chief officers and superintendents.
25 Inspectors and linemen.
37 Clerks and 1 messenger, or, in all, 70 persons.

There were also the following employés retired on account of old age or disability:

1 Engineer-in-chief	$4,000
1 Controller	2,805
108 Male operators, £9,572, each	445
67 other employés, including linemen, messengers and laborers.	

This is certainly liberal treatment. The same policy is pursued in France, Austria and Germany. In the latter country, postal telegraph employés share with all other government employés the benefits of the system of life insurance and annuities after a long term of service. But the most striking feature of the government telegraphs in its relations to employés is the impartial promotion of every person according to capacity and merit, and the assurance of employment during good behavior.

The tenure of office, or rather of employment, constitutes one of the most commendable features of government telegraphs, and is the most potential safeguard against political interference with persons employed in this branch of the public service. "The greatest trouble we have," said the Director-General of Telegraphs for Germany, "is to get rid of a man that makes himself offensively disagreeable. We cannot discharge a man who has been placed on the permanent employment roll after two years' probationary service, until he has been convicted of a criminal offense before a court under the same process that is prescribed for violators of the criminal code. We can fine him for neglect of duty, or suspend him for a short time, but he cannot be dismissed from the service." In this country operators hold their places subject to the whims and caprice of officials, often their inferiors in point of ability, and no redress is afforded for the most glaring injustice.

Now, a word about the political influences of the postal telegraph. My investigations were confined to four countries, England, France, Austria and Germany. France is a republic like ours, and party feeling is more intense there than in America. England is a constitutional monarchy, governed by a party that holds its supremacy through electoral majorities. Germany and Austria are limited monarchies. In all these countries the uniform response to my inquiries concerning the political interference with telegraph employés, or abuse of power in tampering with messages was uniformly the same. The chief operator of the Swansea (Wales) office declared most emphatically that he was a radical and decidedly opposed to the present conservative party in power. He said, also, that a number of the operators in his office were either radicals or liberals, but "if the postmaster, who has supreme control of the telegraph force, dared to dictate what ticket we should vote, or undertook to interfere in any way with our rights as citizens, we should soon have a Parliamentary inquiry, and the postmaster would soon find himself dismissed in disgrace." In Paris, Mons. Magne, Director-General of Telegraphs, expressed great surprise at my question about political interference with postal telegraph men. "We all exercise our rights as citizens untrammelled," said he; "postal telegraph men are not allowed to take an active part in campaigns or in public meetings, but all vote as they please." Such a thing as trying to delay a political message or tamper with it, or divulge its contents, has never been heard of in France. The attempt, if made, would cause a revolt and overthrow the party that was in power at the next election. The Director-General of German Telegraphs was equally emphatic. He said: "There are quite a number of social democrats in the telegraph service. These men are virtually committed against our form of government, but we cannot interfere with them so long as they do not conduct themselves treasonably." In all European countries the laws against delaying or destroying telegraphic dispatches are much more severe than they are in this country.

It gives me great pleasure to be in a position to pay a high compliment to American telegraph operators. After careful inspection of the postal telegraph in the British metropolis, in Paris, Berlin, Vienna, Birmingham, Manchester, Hamburg, Prague and other European cities, I can truthfully assert that the most skillful telegraphers of the world are in America. One of our first-class operators does fully as much work in a given time as is done in London, Paris or Berlin by two operators. On the other hand, the European telegraphers as a class have a higher education and are fitted not only to manipulate instruments and transmit dispatches, but to supervise other branches of the postal service. In Germany telegraphers are classified from the outset into two classes: The first class is made up of men who have received a high school education before entering the service. This class receives the lowest pay and can only aspire to promotion within the telegraph service. The second class is made up from graduates of universities, who are paid a higher salary from the outset, and are in line of promotion as electrical engineers, superintendents and, finally, postmasters in the larger cities. This feature has made the telegraph the stepping-stone towards important positions in the civil service that are directly or indirectly connected with the postal system.

DISCUSSION OF MR. ROSEWATER'S PAPER.

After reading his paper, Mr. Rosewater added the following:

Before concluding, I want to say that in advocating the transformation of our system of telegraph to the postal system I have no personal interest whatever beyond that of a citizen of the United States. I have no grievance against any telegraph official. I am on the very best of terms with all the Western Union officials, so far as I know, and with the Postal telegraph officials, so far as I know. I have always been on good terms with them. The paper, of which I own the greater part, is a member of the Associated Press. We have leased wires and we pay the Western Union, probably, from $15,000 to $20,000 a year for special service; so that I have no grievance whatever, personal or political. I have nothing to redress. But for more than 25 years I have been convinced that sooner or later the government, as a matter of military necessity, and as a matter of commercial necessity, and in the interest of the social intercourse of the common people of the United States, must own the telegraph and operate it; and this conclusion all disinterested parties must reach when they examine impartially the figures and the records that are presented by the reports of the Western Union Telegraph Company and other companies of this country, and the reports that have been made abroad by the different governmental postal telegraph officials. There is no doubt whatever that our wire system is enormously overloaded. We have more wires than we need and we have them in the wrong place, and we do not serve one half the people with telegraphic facilities that ought to have them and at a lower price than they now are; and we cannot lower the prices so long as the present system prevails. Competition is always followed by combinations and one company springs up and declares, like all the newspapers that spring up, that they are here to stay, but in a short time they are swallowed by the great American anaconda. I do not blame the anaconda for swallowing them. They are not very desirable morsels. As a matter of fact, they have congested the anaconda very badly. (Laughter.) But it is one of those laws of necessity. Now, how much longer is this to continue? The present telegraphic system of this country is stocked for about $100,000,000, a little more than that. Upon that the people of the United States, the patrons of these telegraphs are paying, independent of the excessive cost of maintaining and operating, six million or more dollars as dividends. Now, six million dollars on the British basis, or upon the basis that we can establish, for our credit is just as good as that of Great Britain, represents a capitalization of $200,000,000, and we could better afford to-day to pay $200,000,000 for the American telegraph systems, and wipe them out of existence and place them under the control of the government, than we can to continue this system and keep on, like a snowball, rolling and rolling and enlarging, and making it utterly impossible in the future to deal with the problem that must sooner or later meet us again—I speak of the problem of handling telegraph dispatches during time of war. It is all well in time of peace. But those who have been where I was during the rebellion realize, perhaps as fully as any one can, that a government that does not control the arteries of communication and the system which is equivalent to the nervous system of the body, cannot possibly sustain itself in time of war without serious disaster and without an enormous increase of expenses and a prolongation of the war costing millions of dollars and many hundreds and thousands of lives. I have said it and I can repeat it to night, that I am fully convinced, if the government of the United States had owned the wires at the outbreak of the rebellion in 1861, the war would not have lasted more than two years. But I cannot digress in this way now, and I will leave it to other gentlemen, for I would like to have this matter thoroughly discussed. There are two sides to it, as has been said before, and I would be pleased to hear from those who differ with me on this question. I thank you very much for you kind attention. (Applause.)

The Chairman (Mr. Erastus Wiman): I am sure the Club is very much indebted to Mr. Rosewater for the very admirable address that he has presented, and I am delighted to see to-night so many practical telegraphers and electrical men in the room talk on this subject. It does not become me, as the presiding officer, to criticise in any degree the very excellent address that has been presented, especially as being in the position of a director of the great American anaconda he has spoken of and as president of one of the little annexes away off in the Northwestern land. But I cannot take my seat without expressing a sense of surprise and disappointment that the arguments in favor of a government telegraph are so few and so immature in the mind of the gentleman who has read the address. It seems that the pneumatic system of London is the strongest claim for government telegraphy. I cannot imagine that we cannot have the pneumatic system in New York, Boston and Philadelphia, and even Omaha, as complete as they have it in London, if we want to, and why it is necessary that we should have a government control for that is beyond my comprehension. For the present moment the single argument in favor of the postal telegraph system of a governmental character is the pneumatic system in London. There are many other points in the address, however, that it is not now necessary to go into. But there is just one I would like to mention, and that is the revelation again of the fact that the government were fools enough to refuse for $100,000 the stupendous means of instantaneous communication that now throbs through this country. If they were fools enough at that day to refuse that great gift for that small sum, what sense has the government since got that it will not be as foolish again under similar circumstances? (Applause.) I am very much disappointed, I am almost sorry that my friend has given us so much information and so little argument. I confess I do not see one single thing on which a thread of an argument can rest in favor of government telegraphy, except it be that the business of the newspapers is all sent to the intelligence office in London. Now, at the time of an election, when Boss Platt is on one side of the road and Boss Croker on the other, and all the information for the newspapers is sent to the intelligence office, I should be very sorry to be a director in the Western Union under such circumstances, because it would seem to me if we did not have the information to suit Boss Platt he would dismiss us all the next morning, or if it did not suit Mr. Croker, he would dismiss us the next morning. The conditions that prevail on the other side are so entirely different. The principles of self-government are so developed here that every man is a sovereign himself and there is no relation at all, as to the transmission of information, and especially as to the press reports between what would occur in England or Germany or Austria, and what would occur in New York. I do not see, in all the information our friend has given us about the lowest rates and the splendid service they render, what protection they would have if the doctrine which underlies our government, namely, to the victor belongs the spoils, prevail in telegraphy as it does in post offices and every other part of our government system.

It has always been a matter of surprise to me that those who say that the government should go into any business should want to have it go into electricity. It seems to me it would be better to go into oil. If the government wants to do the people good and exercise paternalism over them, oil would be very much more adapted to its purpose. The objection against the present system of telegraphy is that it is a monopoly. It is not nearly the monopoly that oil is. There is a great

(*Continued on page 228.*)

PRACTICAL NOTES ON THE REFLECTING GALVANOMETER AND ITS ACCESSORIES.

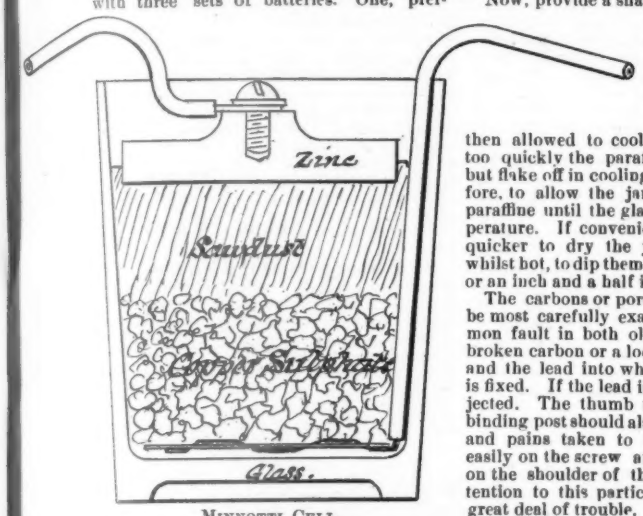
BY J. D. BISHOP.

III.

BATTERIES.

After the galvanometer, the most important adjunct to the testing room is the battery, as the range of testing that can be done will depend entirely on the number and condition of the cells it contains.

Every testing room should be provided with three sets of batteries. One, preferably a sulphate of copper battery, for conductivity tests; a portable one, than which the writer knows none better than Barret's chloride of silver cells; and a third will be the main or large battery for insulation testing purposes, and as this is the most important, we will treat of it first.



MINNOTTI CELL.

Of course, the potential of your testing battery will depend entirely on the range of your work. If you have nothing to do but test ordinary cables for underground use, such as telephone, telegraph or electric light cables, a battery of 200 cells will be large enough. If, however, you have to experiment with very short lengths of cable, say, 50 feet and under, or have to deal with insulating substances, then you will require a much larger battery, certainly not less than 1,000 cells, or even 2,000. This seems to indicate a heavy outlay for battery power. If you can afford it, the best battery for this purpose is the smallest size ordinary porous pot, Leclanché or any other modification of the sal-ammoniac cell. These need not, however, be new, and the best way is to get them second-hand from some telephone company. Cells which are useless to them for transmitter or bell work, still retain ample strength for testing purposes.

The first thing to do is to provide a rack for them, which should be placed in a room by itself, and the racks arranged, not against the walls, but standing in rows with a space between them so as to be accessible on each side. The lowest rack should be 18 inches from the ground; this affords a space for spare jars, sweeping, etc., and prevents too much stooping in setting up or examining the jars. Four or five tiers, one above the other, will make the racks quite high enough to be attended to with ease. The cells may be placed in double rank with as many in a line on each tier as the space at command will allow. The racks should be made strong, because of the weight they will have to carry, but need not be unnecessarily heavy and the shelves should not be made of plain flat plank, nor yet with plain plank grooved, as is sometimes done, but should be made of strips of wood of triangular section, placed sharp end upwards, and from one inch to one and a half inch apart, according to the size of your cells. It is more economical to have these strips run lengthwise, but crosswise will do equally well. At least six inches of space should be left between the top of the batteries on one shelf and the bottom of the shelf above it, and when complete should be thoroughly dried and coated with good hard varnish. A good cross section for these strips is obtained by sawing one inch strips from a two inch plank and starting three-quarters of an inch from the bottom of the cross section, plane down each side for an inch and a quarter at an angle, until the original one inch at the top is reduced to a wedge shape point. The object of this wedge shape is to support the jars with as little surface contact as possible.

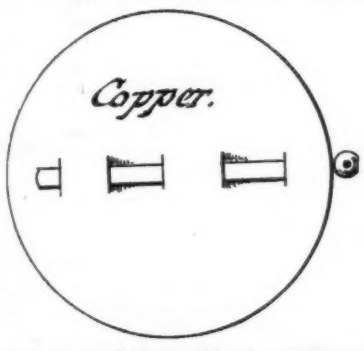
Whether the cells are new or old, the carbons and zincs should be removed therefrom and each bottle carefully washed, dried and examined for cracks or other defects; this should be done very carefully, for there is nothing so troublesome as a slowly leaking jar, and many jars, apparently water-tight when filled, contain small fissures which, after working some time, allow the solution to ooze through.

The exposure to the air evaporates the water of the solution and leaves a deposit of crystals of sal-ammoniac which gradually extends over the surface and causes more trouble and annoyance than an actual and visible leak. The jars, after washing, must be thoroughly dried, which is best done by, leaving them to themselves mouth upwards, thus allowing the rim of the mouth to become perfectly dry, which is a matter of great importance.

Now, provide a shallow tin pan in which, over a gas stove or other suitable contrivance, melt some ordinary paraffine wax, into which the mouths of the jars are to be dipped and then allowed to cool. If the dip is made too quickly the paraffine will not adhere, but flake off in cooling; it is necessary, therefore, to allow the jars to remain in the hot paraffine until the glass is of the same temperature. If conveniences are at hand it is quicker to dry the jars in an oven and, whilst hot, to dip them. If dipped for an inch or an inch and a half it will suffice.

The carbons or porous pots should next be most carefully examined. A very common fault in both old and new cells is a broken carbon or a loose contact between it and the lead into which the binding screw is fixed. If the lead is loose it should be rejected. The thumb nut and screw of the binding post should also be carefully cleaned and pains taken to make the nut move easily on the screw and seat itself squarely on the shoulder of the binding post. Attention to this particular point will save a great deal of trouble.

The inexperienced electrician will meet with many sources of annoyance and vexation apparently impossible of explanation, and the most trying of these, as well as the most difficult to find, is a loose or intermittent contact. When one occurs he may go over every screw connection there is in the battery and feel certain that all contacts are tight because not one of the carbon screws "gives" under his fingers—he may go over them 20 times and be perfectly certain in his own mind that every contact is firmly screwed, but there may be one cell the screw of which is jammed on its own thread and refuses to go further, thus leaving a space between itself and the shoulder of the binding post, where the wire from the next zinc has plenty of chance to move with every vibration of the floor or variation of the temperature. One or two experiences such as this will teach a severe lesson on the value of good contacts.



ZINCS.

The zincs also, whether new or old, should be examined for loose wires or binding screws, and the foregoing remarks on carbons apply equally well for zincs. If the zincs are old, a slight amount of corrosion does not harm, but if very much corroded they should be rejected. Corrosion generally takes place to the greatest extent at the surface line of the solution, and all zincs are very apt to corrode through at this point or a little beneath it, and allow the end of the zinc to fall to the bottom; the effect of this is not noticeable at first, but after a few days the little zinc remaining in contact with the surface of the solution is consumed and crystals begin to form, and, subsequently, dissolve and reform in the space between them. This forms another kind of intermittent contact, which is more difficult to discover than the loose wire contact spoken of above, and is in itself a sufficient reason why the jars should not be placed more than two abreast, as this fault demands the removal of the jar for the substitution of a new zinc.

Jars, carbons and zincs, being now ready, the next thing is to prepare the connecting wires. Of course, any old pieces of wire may be deemed good enough for this, but there is a right and a wrong way of doing everything. Cut off 18 inch lengths of good No. 18 double covered office wire. Carefully remove from each end about one inch of the covering and with a pair of dog-nosed pliers bend the wire into a round hook a very little larger than the screw of the binding post. Now, take a common round lead pencil or a short piece of metal tubing about the same diameter and coil each piece into a close spiral, leaving an inch at each end uncoiled. If the zincs are fitted with iron wires, these spirals will not be required.

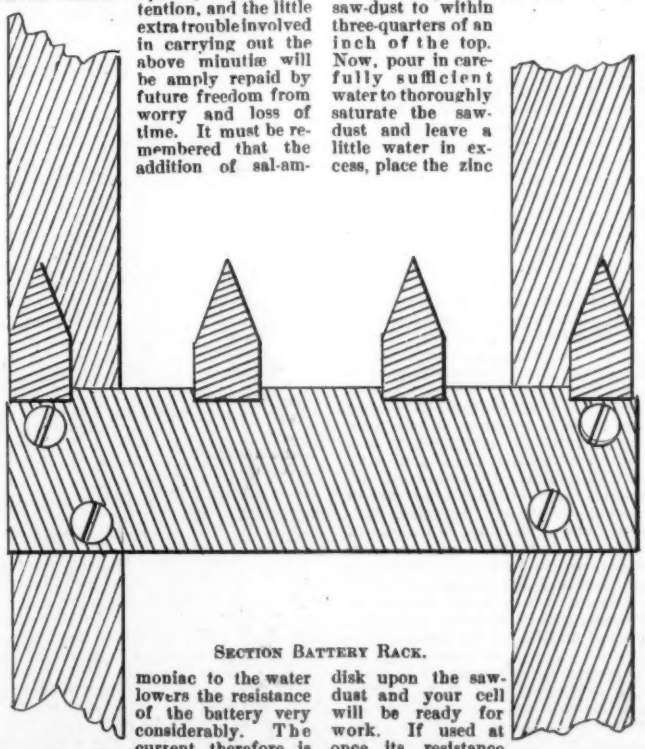
All being now in readiness, the next thing to do is to charge the cells. It is often considered that water alone is sufficient for this purpose, but batteries so charged run down very easily and by so doing sometimes cause considerable trouble, it is, therefore, better to use solution of sal-ammoniac.

In the bottom of each jar, therefore, place about two ounces of sal-ammoniac, such as is ordinarily provided with the cells, and on the top of this put so much water as will, when the zincs and carbons are in place, bring its level half-way up the jar. The quantity necessary for this may be ascertained by trial before filling them. This should be done with great care and the water poured into the middle of the jar so that neither the sides or the rim be wetted; if by accident they should become so, they should be carefully wiped, otherwise crystals of sal-ammoniac are liable to creep up and form a dirty jar. The carbons and zincs are then carefully put in without splashing. Previous, however, to putting the carbons in, it is a good plan to fix on one of the connecting wires, as the connection is more easily made before putting the carbons in the jar than after. The jars being thus far ready, pour in on the top of the water about an inch depth of heavy kerosene oil by means of a long spouted kettle or funnel. This layer of oil serves to prevent evaporation and also the formation and creeping of sal-ammoniac crystals, thus keeping the battery clean and full.

Zincs and carbons so treated may be removed from the jars when necessary and replaced without the slightest detriment to the working of the cell, as the oil which remains on the surface on removal, entirely leaves them again when they are replaced in the solution.

Place each jar with the zincs all pointing the same way, about two inches apart from each other, stretch the spiral connecting wires out so that they may easily reach the zinc in the next jar and connect the two together. The spiral should be bent by the fingers, so as to bring such a strain on the zinc as will keep its lower end snugly seated in the depression at the bottom formed by the angle of the jar; attention must be paid to this, especially where agglomerate cells are used, in which case it is also advisable to provide the zinc at its lower extremity with a vulcanized rubber ring, and thus prevent its coming into contact with the other element.

A battery put up in this way and kept in a dry room at an even temperature of, say, about 60 degrees F. will last for an indefinate period without requiring the least attention, and the little extra trouble involved in carrying out the above minutiæ will be amply repaid by future freedom from worry and loss of time. It must be remembered that the addition of sal-ammoniac to the water lowers the resistance of the battery very considerably. The current, therefore, is much stronger than would be the case if the sal-ammoniac was omitted and water alone used, so that extra care must be taken to avoid closing the circuit through resistance coils, shunts or galvanometer, otherwise damage may be caused. As galvanometer work, however, demands the greatest possible care throughout its whole range, this will not happen with an attentive operator. If the operator is not inclined to be attentive and cautious, he had better resign all thought of ever becoming a successful galvanometer man.


SECTION BATTERY RACK.

If the above instructions appear too minute, it must be remembered that a laxity fairly permissible, in connecting up a couple of transmitter or bell circuit cells, is altogether inadmissible where 400 or 500 or 1,000 cells are to be connected up for delicate galvanometer work.

If Leclanché cells are unobtainable, the following will make a very cheap and useful battery:

Minnotti——Procure an ordinary drinking tumbler, small half-pint size will be sufficient, and dip the rim in hot paraffine as described above. Provide a circular disk of thin sheet copper of a size to lie snugly at the bottom. It may be cut out with small shears or strong scissors. Punch three or four slits in it, a quarter inch long and a quarter of an inch apart, without any particular regard to their position on the disk, provided they are in line. Now, provide a mould in which to cast zincs, which should be a quarter of an inch less in diameter than the inside of the tumbler at a depth of one inch from the top. These zincs should be disks three-eighths of an inch thick and cast with a center five-eighths of an inch in diameter and three-eighths of an inch high, so that the thickness of the zinc in the center will enable it to be tapped to receive a stout half-inch coarse threaded brass machine screw, and the hole for the screw must not be tapped through. The bottom of the zinc should be level, clean and bright.

The easiest way is to chuck it in a lathe and turn it off. Now, take a foot length of No. 16 or No. 18 copper wire well insulated with india-rubber, gutta-percha or Okonite, bare one end carefully for a length of two inches and open the slits in the copper disk so as to thread the bare copper wire through them, the insulation being close to the disk. Lay the disk on an anvil and flatten down the wire with two or three sharp blows of a hammer, so as to make a tight and firm connection, lay the disk in the bottom of the tumbler, to do which you will have to bend the connecting wire at right angles, and then bend it again horizontally at right angles at a point about an inch above the rim of the tumbler, coil the wire outside the tumbler in a spiral and bare the wire for three-quarters of an inch. Bend the bared wire into a circle to fit closely around the machine screw in the zinc disk, between the head of which and the wire has previously been placed a copper washer. Get as many of these as required.

To set up the battery, place the copper disk with its attached wire in the bottom of the tumbler and on it place a layer of crystals of sulphate of copper about half-way up the tumbler. They should be crushed small but not into powder. On this ram down closely a layer of fine dry white pine saw-dust to within three-quarters of an inch of the top. Now, pour in carefully sufficient water to thoroughly saturate the saw-dust and leave a little water in excess, place the zinc disk upon the saw-dust and your cell will be ready for work. If used at once its resistance will be very high, but it will gradually become lower, until the water has dissolved the sulphate of copper sufficiently to allow acid to reach the zinc. Then it will remain perfectly constant. These cells are remarkably steady in work, take up very little room, and, with the occasional addition of a little water, will work for months.

SHALL THE GOVERNMENT CONTROL THE TELEGRAPH?

(*Continued from page 226.*)

deal more monopoly to-day in the Standard Oil Company than there is in the Western Union Company. There is only one oil company and there are 40 telegraph companies. A man can go to Wall street and buy a share at about 80 or 83 in the Western Union Company. To save his soul he cannot buy a share in the Standard Oil Company. It is a fact that not three per cent. of the population of the United States use the telegraph; while I believe 97 per cent. use oil. In England, it is said, that nearly every post office has a telegraph, and if in America every post office were to have a telegraph, the deficiency, with our 60,000 post offices, would be so great that the entire surplus, with which we are so much burdened just now, notwithstanding the great pension system, would be entirely obliterated. I marvel what would have become of this country if the government had acquired the telegraph. Compare it with the navy, until the last three years, until Mr. Whitney, a good democrat, got hold of it, who was succeeded by Mr. Tracy, a good republican. What has been the expenditure on the navy since Mr. Morse was refused his $100,000? Millions and millions; and yet we did not have a craft on which we could place the slightest reliance. Look at the war department, the most complete that we have and the least influenced by political consideration. Go to Staten Island and to Governor's Island and look at the miserable system of defense that there is. See a great war department and a great navy department spending millions and millions of dollars and yet remaining in a most inefficient condition. I marvel what would have happened to this country if the means of instantaneous communication over its broad expanse were in the hands of Mr. Wanamaker, who is a good man for the bargain counter, I am sure, but who might not succeed beyond that. I marvel at the fact that such a thorough-going man as my good friend Rosewater should for a moment stand up and argue in favor of a government telegraph. I feel sorry, in a certain sense, that my friend has not given a better argument. Still, at the same time, I feel sure that my good friend Mr. Foote, whom I will call upon, will give us something on the other side.

Mr. Allen R. Foote: I think that Mr Rosewater and Mr. Wiman had both lost sight of the fact that whoever operates the telegraph, whether it is done under the ownership of a corporation or under governmental ownership, must employ people to do the work. Those people, in this country, are bound to be politicians. We have politics on both sides operating the telegraph, and there has never been any complaint from either political party that they were badly treated under the present system; but how they would get along under government ownership I do not know. Mr. Rosewater closed his paper with a statement that it was necessary for the safety of this country that the government should own the telegraph. We have supposed that it was necessary for the safety of this country that the government should own its army. When the civil war broke out in 1861, the men who were loyal handled the telegraph keys loyally. The men who were disloyal did the other thing. We had in our government men who we educated at West Point, and one of them became President of the Southern Confederacy. The government owned West Point, and owns it yet. If government ownership were a security against disloyalty, there should have been no disloyal men in the Southern army who were educated at West Point. Will Mr. Rosewater say to this audience or to his association of Old Time Telegraphers or to the Military Telegraphers' Association, that the service was not safe in their hands during the war? Was not that service done well and loyally? Mr. Rosewater paid a compliment to the operators in America by saying that one operator in America would do about twice the work that an operator in England would do—two to one. My observation of the way clerks work in the city of Washington is, that the clerks in your offices in your pr vate business do twice the work that the clerks in Washington do—two to one. I do not see in that any reason why the government should own the telegraph. (Applause.) I understood Mr. Rosewater to say that the countries in Europe where the government owns the telegraph are as quick to take up inventions and utilize them as they are in this country. I understood him to say, also, that in three out of the four countries that he visits, messages were received by the recording Morse instrument; that the only exception was England, where they worked by sound. I may have misunderstood, but that is the way I understood him. I am somewhat disappointed that Mr. Rosewater told us so much about the detail—the mechanism of the telegraph—and so little of the argument of government ownership. I am not clear now, from what he has stated, whether he means to advocate government ownership or government control. There is quite a broad difference between the two. Not knowing what Mr. Rosewater was to say this evening, I took a reported interview with him, which appears in the ELECTRICAL REVIEW.

We are under the impression that a postal telegraph system means an office at each post office. That is the impression given out. We find that is not the case in England, according to the best statistics I can get. In England, in 1869, there were 17,829 post offices and 7,021 telegraph offices, being one telegraph office for every 2½ post offices. In the United States for 1891, I believe these statistics are from the *World* Almanac, there are 66,000 post offices and 25,591 telegraph offices, being one telegraph office for every $2\frac{1}{10}$ post offices, so that the percentage of telegraph offices to post offices in this country is a little greater than it is in England. In England the increase in the number of telegraph offices for two years from 1887 to 1889 was 517. There were 6,514 offices in 1887 and 7,031 in 1889. In the United States, the increase for the same time was 3,116, the offices being in 1887, 15,876, and in 1889, 18,992. The increase for England on 6,514 offices is but eight per cent., while the increase for the United States on 15,876 offices is about 20 per cent. The increase for the United States, 3,116 offices, on that number of offices in England, is nearly 48 per cent. against the English increase of but eight per cent. Mr. Rosewater did say that we had too many wires here and that the country was doing about one-half the business it ought to do. We may look to the explanation of that in this little detailed statement of telegraph offices per population.

NEW ARC ELECTRIC COAL CUTTER—(See Page 223).

In England, taking the census of 1881, and adding 10 per cent. to bring it up to date, there is one office for every 5,500 population. In the United States, there is one office for every 2,400 population. I wonder why Mr. Rosewater did not stay in England and get the people to extend the benefits of the telegraph, so that the people might be served in equal proportion to the United States. The size of the country has something to do with the problem—telegraph offices to England. In England there is one office to 17.27 square miles. In the United States there is one office to 131 square miles. The population to the square mile has something to do with it. In England there are 320 to one square mile. In the United States there 17.93 to one square mile.

The area and population to telegraph offices compares as follows:

England, area, 17.27 square miles; population, 5,526.

United States, area, 131 square miles; population, 2,349.

A short time ago it became my duty to make a schedule for correcting the statistics of telegraph companies for the eleventh census of the United States. In a circular report which I call for from the companies they wanted to enter commercial news messages, press messages, etc. I said no; what I want is a report that will show what the farmer and the wage-workers of this country are paying for the service you are rendering in comparison with what the same class of people pay for the service rendered them by governments that own and operate the telegraph system in foreign countries. For this reason I would admit to the report full rate, night rate and the money transfer messages only, and at the rate now being paid over the country by any one who may have occasion to use the telegraph. I have made up the figures on 8,358 full rate messages, 614 night rate messages and six money transfer messages. I find that these messages contained 195,914 words, counting all words in the address, body and signature of the message, making an average of 21.82 words per message. The reason for counting the words in this way is that the governments owning and operating a telegraph system count and charge for every word transmitted. The English rate would be 21 cents per message. The tolls paid for these messages in the United States average 41¼ cents. So that on the face of the showing thus far made it would appear that the rate in this country is double that of England I find, however, that the average mileage of those messages was 540 miles, and the average distance from New York to the places to which they were sent is 603 miles. On an account of distance the office in transmitting 8,978 messages repeated over 11,000 messages in the same period of time. As the biggest distance in England is not over 600 miles it is reasonable to assume that the average mileage of 8,978 messages sent out from London will not exceed one-half the average mileage of the messages sent out from New York. Therefore, messages from New York averaging 540 miles at 41¼ cents are as cheap as messages from London averaging one-half the distance at 21 cents each. This, however, is not the whole story. Messages were sent at the rate given in any direction desired from New York. England is not large enough to make a comparison with the United States. We are compelled to take Europe for such a purpose. If the citizen of London wishes to send his messages 500 or 600 miles from London he must go into other countries, as the American citizen goes from State to State. Let this be tried and then make a comparison of European rates with United States rates.

The rates in New York on 8,978 messages averaging 21.82 words and 540 miles was 41¼ cents. The rate from London for a message of 21.82 words to Sweden is $1.74. United States rate for the same distance 41¼ cents. To Norway, $1.52. United States rate for the same distance 41¼ cents. To Germany, $1.30, against 41¼ cents. To Austria, $1.52, against 41¼. To Corsica, 87 cents, against 41¼. To Spain, $1.74, against 41¼.

I suppose this is plain why so many people come to this country. It must be to enjoy the privilege of telegraphing a long distance at the low price charged by our grinding monopoly. (Applause and laughter.)

I do not know whether Mr. Rosewater can be said to be the representative of the postmaster-general or not; but I do know that we can judge of the kind of advice that the postmaster-general has received on telegraph matters by his official utterances. Here is a government circular dated June 15, 1891, which says, fixing the rate for government messages, 10 words, exclusive of place from, date, address and signature, 10 cents to all distances, 400 miles. As the message actually counts 20 words, that is 10 cents for 20 words for 400 miles. Half a cent a word for additional words. Half a cent for each word in the body. I would like to have Mr. Rosewater state, if he would, if he believes that a charge of one-half a cent a word will pay the expense of doing the business over a distance of 400 miles. On June 29, 1889, the postmaster-general issued an order fixing the rate at one mill a word, irrespectively, for all messages, day and night. If one mill a word for all distances day and night was a fair, honest compensation in 1889, I would like to know what has increased the cost of telegraph service to bring it up to half a cent a word now.

There is one point in this REVIEW article that I want to refer to, and Mr. Rosewater can easily set himself right if he is wrongly reported. He says here: "I would buy out all the telegraph lines in America and then advertise for proposals, and have them operated by private companies under the control of the government, fixing the rates and requiring them to report their earnings from time to time to the government. When the receipts exceeded 10 per cent. upon the invested capital, their investment being rather small, I should insist upon their reducing the rate." I suppose he meant dividends instead of receipts. To give an idea of what Mr. Rosewater considers a small capital, he is reported here as saying that the government at the time, that is, February 27, 1866, when the government turned over its lines to the private companies—the government at that time owned 41,211 miles of land line and 178 miles of submarine cable. I understand that to mean miles of wire instead of miles of line. He is reported to have said that the property was worth $2,000,000 or $3,000,000. Was it miles of line or miles of wire?

Mr. Rosewater: I presume it is miles of wire.

Mr. Foote: Assuming that Mr. Rosewater means miles of wire and that he will probably agree that the true valuation would be the average between his extremes, the statement may be construed to mean that the government owned 14,389 miles of wire worth $2,500,000, or about $174 per mile. At this rate the present valuation of the combined mileage of the Western Union and Postal Telegraph-Cable Companies is $138,332,834. Now, if the military telegraph lines were worth $174 a mile, it is fair to presume that the lines that are working now commercially are worth as much. On that computation, however, the capitalization of these companies does not begin to reach the values given to it by Mr. Rosewater. That may be where the watered stock is to come in. I am of opinion that if Mr. Rosewater can induce the government so to fix rates that those companies can earn 10 per cent. on this valuation, that they will give him an exclusive contract to attend to their stock watering hereafter.

Government ownership is advocated by Mr. Rosewater as a principle. In my opinion the principle is radically wrong. It is opposed, as I understand the matter, to the underlying fundamental natural laws that govern all human actions. When you separate a man from any direct interest in his work or any hope of having a direct interest in his work, you separate that man from the most active elements that can induce him to be thrifty, saving, progressive, observing and careful in everything he does. I do not suppose that any of you gentlemen will admit for one moment that there has ever been a work undertaken by government that has been executed at anything like the cost it could have been done for by private parties. A gentleman with whom I was conversing in Boston not long ago—a very competent engineer—observing the work of government buildings, of forts and arsenals, etc., told me that he did not believe that, with two or three exceptions in these United States, there had been one single instance where a government building had been put up at anything like the cost it could have been put up for by private parties. He estimated that the excessive cost was at least 100 per cent. In other words,

it cost the government twice as much to do the work as it would private parties. Assuming, for the sake of argument, that the capitalization of these telegraph companies could be agreed upon—they have accepted a law passed by Congress in 1866 which defines the way in which the government can acquire possession of the telegraph companies. If that were to be carried into operation, the capitalization agreed upon and the interest on the capital figured at the same rate that the government pays on its bonds, the capitalization question would be out of the way. Then comes the question of maintenance and operating expenses. I do not think any one will suppose for an instance that those expenses, operating under government control in this country, would come anywhere within the limits that they do under private management. I do not think that 20 per cent. difference would be any too large a margin to allow for that. Therefore, I assume that the telegraphs of this country, operated under private management, doing a business of the same rate that it would cost the government to do the business, could pay at least a 10 per cent. dividend, and at the same time be giving the service at what the ordinary politician calls cost, which is what it would cost the government.

The absence of statistics in all these details is one of the weak points in the argument When we do not have statistics which both sides can agree upon as being true and accurate, we cannot follow our argument through its legitimate course. I have under my hands the work of obtaining these statistics from the telegraph companies in the United States. That work will be accomplished in the course of time, provided that the government will furnish the funds to do the work. We are now practically at a standstill. Those of you who want to have the statistics made up in that way will have to assist in getting the appropriation. (Applause.)

Mr. Insull: On hearing our friend, Mr. Wiman, talk of commercial union, I never have been able to make up my mind whether he talked as a resident of the United States with large interests here or as subject of the Queen, as I believe he is to-day. But when he gets up here to talk to us on the question of government control of telegraphs, there is not the slightest doubt from whence he draws his experience. If he is afraid of Mr. Boss Platt at one time having control of our telegraph system and using it for his own particular interest, and of Tammany politicians having control of it at another time, he evidently is drawing upon the experience of his friends and fellow subjects in Canada, where we find lots of trouble with the Tories in the Dominion and with the Liberals in Quebec.

So far as Mr. Foote's remarks are concerned, when he first addressed you, he referred to the treatment of inventors, I think. There is one thing that those of us who go to the other side much must have noticed, that whilst our telegraph companies here and our telephone companies here were arguing as to the impossibility of placing their wires underground, that that same work had been done in London by the postal telegraph department for years past, and it would seem from that that the telegraph companies here consider not so much public convenience as their own pockets. The question of government control of anything, I presume, depends upon the particular principle of government that we should have the greatest possible good to the greatest number. Does it seem reasonable that the pioneer who goes to the Northwest, I will take Mr. Wiman's side of the line, and starts to develop a country, or if he wishes to communicate with his base of supplies, should be taxed to the extent, not of 12 cents for 20 words, but of 18 cents for a single word? Can that lead to the rapid development of any new country? If it is reasonable that the man living in the Rocky Mountains shall have to pay a dollar for 10 words and be without the advantage of a night rate, why is it not reasonable that the same man, if he requires the protection of our military, should pay much higher rates of taxes than the people living in a city like New York? The great advantage of the government administration of telegraphs, more especially in England, where I have had some experience, is that if you are in the smallest village where there is transmitted but one message a day, you pay exactly the same rate as you would in a larger city, and the business man has the same opportunity there to develop his business that the man has who lives in a large center of population. I presume that the expenses of the business are proportionately larger in a small place than they are in a large one. Those of us who run small businesses find that the expenses of business is greater under those circumstances. Does it seem reasonable that the merchant should be taxed to a much far great extent than the man living in that smaller town. I think you will find the tendency of all governments is to take control of all matters where a business is built up and vested interests acquired, by taking advantage, not of any private rights, but of public rights. The Congress of the United States seems to have recognized that state of affairs so far as the railways are concerned, and they have taken control to a greater or less extent, according to the shrewdness of railroad officials, of rates of transportation and of passenger rates. I cannot see why the same control cannot be taken of the telegraph companies with advantage to the public at large. Whether that control is exercised by direct ownership or by some such control as we have in the case of the inter state commerce law—whatever way it is done, I think it would certainly be of advantage to those of us who have to use telegraph facilities for the purpose of running our business. Mr. Foote drew attention to some comparative figures as to telegraph offices; but he did not mention that in a small place of five or ten thousand inhabitants, owing to the exigencies of competition, you will find not only a Western Union office, but also a Postal office, and, a short time ago, a Baltimore & Ohio office. Now such a thing is not at all a necessity; one office could do the business just as well as three, and, therefore, it is not fair to take those comparative figures. In a country like the United States, where private ownership is the rule in telegraph business, to compare that with a country like great Britain, where you have government ownership, and, consequently, the necessity for competitive offices removed, the comparison is not fair. He also made a comparison between the post offices and the telegraph offices. But if he were acquainted with the English postal system, and were aware of the fact that almost at every street corner you will find a post office, I do not think that he would have used those figures. It would be absolutely impracticable and absolutely unnecessary, I think, to have a telegraph office wherever there is a post office. I have lived in New York a good many years, and I have often had a great deal of trouble in finding post offices. An absolute stranger never finds such trouble in London. I have no decided views on this subject one way or the other, but I think some of the comparisons Mr. Foote made show some inconsistencies, when you look into the details of the business in the two countries.

On the question of the work done by operators in this country and operators in England, I think such of our members present as are posted on European telegraph service will tell you that the atmospheric conditions have something to do with that. I think it is a question of rapidity of operating; but I am trespassing on a subject that I am not at all posted upon.

Mr. Rosewater: The presiding officer of this club has seen fit to pour oil upon the troubled waters here, and pour it on very promiscuously, for the amusement of the audience; but I do not think it is necessary for me to discuss the oil question in connection with postal telegraphy. He said here that I had brought forth no argument in favor of the postal telegraph, and had not supported my statement with figures sufficient to show whether or not the British and foreign telegraphs were equal in number to post offices, whether we wanted a post office at every telegraph station, and whether we proposed to increase the civil service by an enormous list. Now, I happen to have with me a few figures that I made up to-day from the official book that I have here, made up really in the German language by the Austrian government, giving a full account of all European postal facilities and telegraphic facilities, and I find this to be the fact that in Great Britain the number of post offices, by the last report of the postmaster-general was 18,359, the number of telegraph stations 7,627. That is for the year 1889. I have a report with estimates for 1892. They have only 5,912 postal telegraph offices and 1,715 railroad telegraph offices in Great Britain.

France is the only country in Europe probably, and perhaps in the world, that has more telegraph offices than post offices. She has 7,026 post offices and 9,498 telegraph offices, of which 6,086 are postal and 3,412 are railroad.

Austria has 18,017 post offices and 10,806 telegraph offices, of which 5,311 are postal and 5,495 are railroad.

Germany has the largest postal telegraph system in Europe. She has 21,212 post offices and 16,408 telegraph offices, of which 12,431 are postal and 3,977 railroad.

Now, computing the whole thing, what do we see? In all these four great countries the total number of post offices is 64,614, and the number of telegraph stations 44,339. You notice that there are nearly two thirds as many telegraph stations as post offices, and notwithstanding my friend's statistics I would venture to say that he is entirely mistaken, unless Dr. Green gave wrong figures to the government last Winter. According to Dr. Green there are some 18,600 telegraph stations in America, including all the railroads, and to the best of my knowledge the number of post offices is about 60,000 or 61,000. Now, we have over 60,000 post offices and only 18,600 and some odd telegraph offices, and of these you find that the telegraph companies have got less than 5,000. All the telegraph companies have got less than 5,000 telegraph offices and the balance are all railroad offices. Now, just

FIG. 1.—A UNIQUE LAMP SHIELD.

compare those countries and see what an absurdity. This is a striking argument, it seems to me, in favor of postal telegraphy, because it enables the people in the smaller towns and villages to get the facilities of the telegraph, and while my friend here says that there are only a few clod-hoppers out in the West that are entirely cut off, it seems to me that every citizen of the United States is as good as every other citizen, and it doesn't matter whether he is on a farm or in a work shop. The object of the postal system is to facilitate the intercommunication of intelligence. If that had been established, no matter what disparaging state-

FIG. 2.—ANOTHER ARRANGEMENT OF SHIELD.

ments have been made here to-day as regards the mismanagement of different branches of governments, I defy any man here to come forward and show where there is a better system under corporate control than the post office system of the United States to-day. (Applause.) I defy——

Mr. Sam. Bryan (of Washington): I accept that challenge with very great pleasure.

The Chairman: Mr. Bryan, we will give you an opportunity as soon as Mr. Rosewater has finished.

Mr. Rosewater: If you can show that the millions and millions of letters and the vast quantities of newspapers that are transmitted all over the United States for distances covering something like 160,000 miles of railway, and traversing these railroads at every hour of the day all over the United States, handled in every railway mail car and thrown off by fast mail trains, handled on the steamships as I have seem right here—there were 100 000 letters handled by the American postal clerk, who was on the steamship and who assorted them between Hamburg and New York and placed them in packages going all over the United States, including Omaha, if you please, and every other town. I say that the postal system of the United States is admirably managed, whether Mr. Wanamaker measures his letters by the yard or weighs them by the pound. I have not been paid by the post office department and have not been authorized to speak for it, but I will say for Mr. Wanamaker, and I have been acquainted with every Postmaster from the days of Creswell down to to-day, that he is the most efficient man in the department and has more business in him than any other man that was ever in it.

Mr. Foote has called me to task here about a question, and it is a very serious one, in his opinion at least, as to what the value was of the telegraph lines turned over to the various companies by the government after the war. It is true that I charged at Washington last Winter, before the congressional committee, that after the war, without any compensation whatever, 44,000 miles of wire and something like 160 or 200 miles of cable and all the instruments and machinery and all the appliances that had been used in the military telegraph service, were turned over to the companies without a dollar, and I have the audacity to say that they were worth about $2,000,000. Well, I meant $2,000,000 at the time they were turned over, when gold was worth about 180 cents and everything was proportionately high. But, after all, it is very remarkable that the gentlemen should venture to the defense of this peculiar transaction. It was certainly a transaction that requires explanation. It was a transaction that I never have been able to explain to myself. When I went to investigate it in the quartermaster general's office, I thought that the government had sold out those things, as I stated then, as old junk, as so much a pound for the wire and so much per cord for the poles. But, as a matter of fact, the goverment actually turned it all over for nothing at the instance of the gentlemen who were managing the telegraph companies. Now we have been given here a promiscuous line of figures. I do not think it is necessary for me to repeat the telegraph tariffs abroad.

I expect to go before the congressional committee, probably this Winter some time. If I appear before that committee some of these figures might perhaps be more appreciated than they would be right here to-night. But I just want to call attention to a few little items. For instance, in 1880, the Western Union had a capital and a debt of $46,000,000, and now it has only $98,250,000. The consolidations that have taken place in 10 years have almost duplicated the entire capital and debt.

Mr. S. Bryan, of Washington, spoke at length of the defects in our postal system, claiming that it was the worst in the world, with the exception of a few of the Latin countries. A letter posted at Twenty-third street, New York, at 7 P. M., would not reach Washington and be delivered until one o'clock the next day. Mr. Bryan also favored Sunday delivery. He said the telegraph service of England and France was not near so prompt as with us.

Mr. E. A. Leslie spoke of his acquaintance with Mr. Rosewater, and stated that underlying all of Mr. Rosewater's arguments for a postal telegraph was the welfare of the telegraph operator. After tending a vote of thanks to Mr. Rosewater, Chairman Wiman declared the meeting adjourned.

A New Lamp Shield.

The McCreary Electrical Specialty Co., N. Y., always on the alert to procure the best appliances for protecting the eyes from the incandescent electric lamp, have just secured the exclusive control of a very useful invention, shown in the accompanying illustrations, which is to be called "The Adjustable Electric Light Shield." It is fitted with a spring clamp which can be attached to any socket, the shield can be moved to any place along the wire and the wire holding the shield will remain in any position above or below the lamp. It takes the place of all kinds of shades which are now tied over the eyes, it being intended to shield the eyes and not to obstruct the light, nor work of any kind. It will be found invaluable to book-keepers, printers, silversmiths and workmen in factories and mills of every description.

KINDRED INTERESTS

The Eastman Company, Rochester, N. Y., report a rushing business in their Kodaks; and, indeed, these little machines seem to be rapidly coming into universal use, both for amusement and business purposes.

The Jos. Dixon Crucible Company have just published a neat little catalogue and price-list of their goods. It is very complete and well gotten up, and will, no doubt, prove valuable to the trade.

The Central Electric Company, Chicago, has just issued a circular giving low prices on a number of standard articles in the supply line. This circular covers sockets, switches, cut-outs, receptacles, attachment plugs, branch blocks, wire guards, tape, shades, lamps and a number of other articles.

The Washington Carbon Company has something to say in one of our advertising pages about carbon and its relation to the electrical industry. They speak of their future intentions relative to the carbon trust. Their announcement is emphatic and will undoubtedly attract the attention of the consumers of carbon. Watch the page card of this company next week. The company will have a good deal more to say.

The Armington and Sims Engine Company, Providence, are now testing one of their largest single expansion direct-acting engines for the Edison Illuminating Company, Chicago. The engines have cylinders 24 inches diameter by 18 inch stroke, with pulleys 92 inches diameter, 21 inch face, to run 210 revolutions per minute. The engines are designed to drive the largest of the Edison generators and will weigh 50,000 pounds each.

The efforts of the Electric Merchandise Company, Chicago, to introduce upon street railways several useful specialties are being rewarded. Unlooked for large sales of Brand's patent track brooms and Wardwells' track broom holders are being made, while equipment of Burton electric heaters is continually being furnished electric roads throughout the country. Of roads thus equipped the past week the following is a list: Ottumwa, Ia.; Reading, Pa.; McKeesport, Va.; Cleveland, O.; Lincoln, Neb.; Martinsburg, W. Va.; Salt Lake City, Utah; Sioux City, Ia.; Marquette, Mich.; Wheeling, W. Va.; Quincy, Ill.; Williamsport, Pa.; Shamokin, Pa.; Bloomington, Ill. Pratt's patent portable fare register is being favorably received, and many orders for the same are being filled.

The Durability of Tobin Bronze.

The Ansonia Brass and Copper Company, of New York, who control the manufacture of the Tobin bronze, have every reason to be proud of the following endorsement:

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(Signed.) W. M. RAMSEY,
Electrical Superintendent,
Federal street and Pleasant Valley Railway Co.

Mr. F. C. Billings, assistant-superintendent of the Billings & Spencer Company, of Hartford, writes to the Ansonia Company, that "the above letter is taken from the catalogue of the Edison General Electric Company, on the Edison system of electric railways, and the commutator bars to which it refers are drop forgings made from Tobin bronze, and were manufactured by the Billings & Spencer Company."

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CHICAGO, 46 SOUTH CANAL STREET.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON NOVEMBER 24, 1891.

463,824 Trolley wire hanger; Edward T. Birdsall, New York, N. Y., and Lemuel W. Serrell, Plainfield, N. J.

463,843 Electric programme clock; John L. McCaskey, Waynesboro, Pa.

463,852 Synchronous telegraph; Charles S. Bradley, Yonkers, N. Y.

463,867 Automatic safety cut-out for electrical conductors; Robert A. Morgan, Jr., Boston, and George C. Bosson, Jr., Lawrence, Mass.

463,879 Separator for the plates of secondary batteries; Charles F. Waldron, Boston, Mass., assignor of one-half to Charles J. Pillsbury and Walter J. Litchfield, same place.

463,945 Therapeutic electric battery; John A. Crisp, Jefferson, O.

463,955 Electric wire insulator; Hiram F. Newell, Manchester, Va.

463,989 Phonograph. 463,990 Starting and stopping device for phonographs; Henry F. Holtz, Washington, D. C., assignor of one-half to William Maurice Lerch, Baltimore, Md.

ISSUED DECEMBER 1.

464,001 Telegraph repeater; Richard L. Atkinson, Delaware Township, N. J., assignor to John D. Tustin, same place.

464,002 Electric brake; La Motte C. Atwood, St. Louis, Mo., assignor to the Atwood Electric Co., same place.

464,005 Treating filaments for incandescent electric lamps; James Bradley, Massillon, O.

464,022 Splice for electric conductors; Willard J. Hield, Minneapolis, Minn.

464,025 Potential indicator. 464,026 Transformer and armature core. 464,027 Field magnet for dynamos or motors; Carl E. Kammeyer, Eau Claire, Wis.

464,055 Electric heater; Parvin Wright, Denver, Colo.

464,063 Electric motor; Martin H. Collom, Denver, Colo.

464,080 Electric apparatus for use on railway trains; Rufus A. Wilder, Cressona, Pa.

464,096 Apparatus for obtaining metals of the alkalies from molten chloride. 464,097 Process of obtaining metallic sodium; Ludwig Grabau, Hanover, Germany.

464,125 Method of testing insulated wires. 464,133 Relay. 464,134 Electric circuit closer; Richard Varley, Jr., Englewood, N. J.

464,129 Crossing for trolley wires; Robert M. Jones, Salt Lake City, Utah.

464,132 Electric arc lamp; William A. Nicholson, New York, N. Y.

464,136 Electric regulator; Charles W. Holtzer and George E. Cabot, Brookline, assignors to the Holtzer-Cabot Electric Co., Boston, Mass.

464,152 Electric transmitting telephone; Rudolf Eickemeyer, Yonkers, N. Y.

464,156 Electric generator; Victor Hirbec, Paris, France.

464,198 Electro magnet; Olof E. Lundstedt, Brooklyn, N. Y.

464,216 Armatures for dynamos and electric motors; St. John V. Day, St. Louis, Mo.

464,231 Electric motor; John R. Robinson, Salem, assignor of one-half to Theodore F. Lawrence, Peabody, Mass.

464,244 Electric fire engine. 464,245 Electric hose carriage. 464,246 464,248 Electrically propelled vehicle. 464,247 Electric heating apparatus; Mark W. Dewey, Syracuse, N. Y., assignor to the Dewey Corporation, same place.

464,256 Watchman's electric recorder; Henry Redding, Everett, assignor to the Redding Electric Co., Boston, Mass.

464,298 Electric wire support; Richard Ellison, Cincinnati, O., assignor to the Walton Architectural Iron Co, same place.

464,299 Electric motor; Herman A. Florian, Detroit, Mich., assignor to Edward A. Florian, Fostoria, O.

464,342 Method of and apparatus for the propulsion of trains; John B. Mahana, Freewater, Ore.

464,347 Magneto-electric ignitor for combustible vapor engines; Leonidas G. Woolley, Grand Rapids, Mich.

464,367 Insulating composition. 464,368 Insulating support for electrical apparatus. 464,369 Composition of matter for insulating purposes. 464,370 Trolley wheel for electric railways. 464,371 Trolley wire hanger; Smith W. Kimble, Denver, Colo., assignor to the Mica Asbetite Insulating Co., same place.

464,411 Hanger for trolley wires; Thomas E. Adams, Cleveland, O., assignor to the Brush Electric Co.

464,470 Electric elevator; William Baxter, Jr., Baltimore, Md.

464,475 Joint for electric conductors; Henry W. Fisher, Pittsburgh, Pa., assignor to the Standard Underground Cable Co., same place.

REISSUE.

11,307 Open circuit battery; John F. Wollensak and William E. Gill, Chicago, Ill.

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